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# USSR Report

CONSTRUCTION AND RELATED INDUSTRIES



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24 January 1986

**USSR REPORT  
CONSTRUCTION AND RELATED INDUSTRIES**

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CONSTRUCTION PLANNING AND ECONOMICS

DECREE BY CONSTRUCTION MINISTRY ON PLANNING AND QUALITY CONTROL

Moscow SOBRANIYE POSTANOVLENIY PRAVITELSTVA RSFSR in Russian No 12, 1985 pp 178-184

/Decree of the RSFSR Council of Ministers, issued 29 March 1985: "On Further Improving Planning-Estimates Work and Raising the Role Played by Expert Examination and Author's Supervision in Construction"/

/Text/ In the interest of further improving planning-estimates work and raising the role played by expert examination and author's supervision in construction and in execution of Decree No. 96 of the USSR Council of Ministers dated 28 January 1985 (SOVETSKOYE PRAVO SSSR, 1985, No. 7, St 26), the RSFSR Council of Ministers decrees:

1. The RSFSR ministries and departments, Roskolkhozstroy Association, the councils of ministers of autonomous republics, krayispolkoms /kray executive committees/, oblispolkoms /oblast executive committees/, the Moscow and Leningrad gorispolkoms /municipal executive committees/, planning, research, scientific-research, design and technological organizations must carry out measures aimed at radically improving the quality of planning and ensuring the extensive use in plans of progressive technologies, equipment, materials, designs and leading methods for organizing production, labor and administration, which will be in keeping with the latest scientific and engineering achievements at the time the projects are placed in operation.

2. It is noted that the USSR Council of Ministers, in Decree No. 96 dated 28 January 1985, established that data on the conformity of the technologies, equipment, construction decisions and the organization of production and labor to the latest achievements of domestic and foreign science and engineering and specific progressive indicators must be cited in the materials which validate the need and feasibility for the construction of installations and in the plans and expert conclusions.

Towards this end, the RSFSR ministries and departments, Roskolkhozstroy obyedineniye, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms, the Moscow and Leningrad gorispolkoms and scientific-research and planning organizations must ensure:

...in the area of technological planning -- the extensive use of highly efficient production processes, low-waste and resource-conserving technology, all-round mechanization, automatic lines, industrial robots, flexible automated

systems and other items of progressive equipment and also an increase in the coefficient of replacement of its operation and growth in labor productivity;

...in the area of construction planning -- a reduction in the material-intensiveness, labor-intensiveness and cost of construction, a reduction in the duration of construction by means of high technological design solutions for the buildings and installations and the introduction of progressive products and materials, enlarged installation units, structures for a high degree of plant readiness and leading methods for construction organization.

In the development of plans, a high level must be ensured for the architectural and town-building solutions and improvements must be carried out in the working and living conditions for workers, taking into account the latest achievements in industrial aesthetics. Consideration must be given to the need for improving planning and raising the quality of dwellings and installations of a social-domestic nature and for creating the best conditions for carrying out mass-cultural work.

It is noted that the USSR Council of Ministers, in Decree No. 96 of 28 January 1985, prohibited the use in plans of technological processes and equipment which are not in keeping with the latest scientific and engineering achievements.

The RSFSR ministries and departments, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, obispolkoms and the Moscow and Leningrad gorispolkoms must ensure strict control over the observance of this requirement.

RSFSR Gosstroy must report annually to the RSFSR Council of Ministers on the degree to which the technical-economic level of the plans for the construction of enterprises and installations, as approved by the ministries and departments of RSFSR, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, obispolkoms and the Moscow and Leningrad gorispolkoms, conforms to the latest scientific and engineering achievements and also on the measures undertaken for further improving the quality of planning.

3. The RSFSR ministries and departments and Roskolkhozstroyobyedineniye must:

...develop in the draft five-year plans a list of projects requiring planning for the next and subsequent five-year plans and which will involve the use of new technological processes and also machines and equipment with an extended cycle for development, design and manufacture;

...develop jointly with the machine-building ministries complete plan-schedules for the carrying out of scientific-research, design and planning work for the mentioned projects, while bearing in mind that the preparation of plans for the construction of such projects must be carried out based upon approved technical plans for the machines and equipment;

...present the indicated lists of projects and complete plan-schedules to RSFSR Gosplan for their subsequent approval by the RSFSR Council of Ministers.

4. For the purpose of improving the existing norms and rules associated with the planning and construction of installations, the RSFSR republic ministries and departments must examine the departmental norms for technological planning and present them to RSFSR Gosplan and RSFSR Gosstroy.

RSFSR Gosplay and RSFSR Gosstroy, by agreement with USSR Gosstroy must approve within a brief period of time the schedules for carrying out this work and, by agreement with USSR Gosstroy and the USSR State Committee for Science and Engineering, present the indicated norms for technological planning to the RSFSR Council of Ministers for approval prior to 1 November 1985.

5. The RSFSR ministries and departments, Roskolkhozstroyobyedeneniye, the councils of ministers of autonomous republics, Krayispolkoms, oblispolkoms and the Moscow and Leningrad gorispolkoms must ensure a further increase in the role played by plans in improving the organization of construction and the development of cost accounting. Towards this end:

...a normative labor-intensiveness should be established in the planning-estimates documentation for the construction of installations in conformity with the normative documents approved by USSR Gosstroy;

...the plans for large enterprises and installations should indicate the underway complexes (including the apartment dwellings and projects of a social-economic nature that are required), with a determination being made as to the limits for capital investments and construction-installation work for them and the requirements for equipment, materials and labor resources;

...when developing the plans for construction organization (which must be mandatory for all participants in the construction), an effort must be made to single out the technological units and work stages and to define the priority order for carrying out the preparatory and principal operations concerned with the construction of the buildings and installations, the calendar periods for construction and for the deliveries of equipment and structures and the requirements for materials, labor resources and mechanization equipment;

...the plans for production operations for the individual buildings and installations must include schedules for carrying out the work, decisions on use of the brigade contract and also measures for exercising control over the quality of the construction.

When necessary, the RSFSR Ministry of Civil Housing Construction creates, within the limits of the overall personnel strength and wage fund established for the ministry, a subunit for examining the planning-estimates documentation, subject to agreement, and also for preparing recommendations for improving the construction decisions and construction organization based upon the specific conditions.

6. To authorize RSFSR Gosstroy to carry out, commencing in 1986 and using state budgetary resources in accordance with plans approved by USSR Gosstroy:

...the development of standard zonal plans for the construction of projects of a civil housing or agricultural nature and also standard branch plans for the construction of principal and auxiliary projects of a production nature;

...the preparation of departmental and republic price lists and consolidated estimate norms for construction;

...the development of branch programming means for computer equipment, automatic planning systems and information processing systems;

...work associated with the carrying out of the functions of leading research organizations.

It is noted that the USSR Council of Ministers, in Decree No. 96 of 28 January 1985, tasked USSR Gosplan with including limits for the budgetary funds required for carrying out this work in the five-year and annual plans for the economic and social development of the USSR.

7. RSFSR Gosplan must ensure the priority allocation to the RSFSR ministries and departments, the enterprises of which require modernization or technical re-equipping, of limits for planning-research work and also the inclusion of the mentioned work in the plans of the planning organizations.

8. The RSFSR ministries and departments, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms and the Moscow and Leningrad gorispolkoms must raise the responsibility of the planning organizations for the carrying out of author's supervision over the construction of enterprises, buildings and installations.

9. In the interest of raising the quality of planning expertise, the RSFSR ministries and departments, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms and the Moscow and Leningrad gorispolkoms must be required:

...to ensure that the expert subunits are staffed with skilled personnel and that they are subordinate as a rule to a minister, the leader of a department, the chairman of the Roskolkhozstroyobyedineniye Administration, the chairman of an autonomous republic council of ministers, krayispolkom, oblispolkom, Moscow and Leningrad gorispolkoms or to their first deputies;

...to examine the plans for large and complicated construction projects during meetings of the boards of RSFSR ministries and departments, the Roskolkhozstroyobyedineniye and the presidiums of autonomous republic councils of ministers and during meetings of the ispolkoms of local soviets of people's deputies and also to ensure strict control over the quality of plans approved by subordinate organizations;

...to examine in a systematic manner the results of the expert analysis and the control exercised over the quality of the plans and to undertake measures aimed at correcting the shortcomings noted.

RSFSR Gosstroy must intensify its control over the quality of the expert analysis being carried out by the RSFSR ministries and departments, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms and by the Moscow and Leningrad gorispolkoms.

RSFSR Gosplan must increase the responsibility of the State Expert Committee for the validity of the results of expertise for projects planned for construction and also the expertise for plans for the development and placement of national economic branches and branches of industry, plans for the development and placement of productive forces by economic regions, autonomous republics, krays and oblasts and technical-economic justifications for the construction of especially large and complicated enterprises and installations.

RSFSR Gosstroy, RSFSR Gosplay, RSFSR ministries and departments, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms and the Moscow and Leningrad gorispolkoms, when providing expert analysis of the technical-economic justifications and plans (working plans), must ensure control over the complete solving of those problems concerned with the construction of projects of a production nature, apartment buildings, projects of a social-domestic nature and environmental protection.

Within a period of 3 months, RSFSR Gosstroy and RSFSR Gosplan must prepare recommendations for the RSFSR Council of Ministers on strengthening the expert subunits of ministries and departments of the RSFSR, the councils of ministers of autonomous republics, krayispolkoms and oblispolkoms.

10. RSFSR Gosstroy must participate in the development by USSR Gosstroy of indexes for price changes for planning work for construction, based upon the principal indicators for the projects planned (capability, extent, capacity, area and so forth).

11. The RSFSR ministries and departments, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms and the Moscow and Leningrad gorispolkoms must:

...develop and approve, commencing in 1986, continuous two-year subject plans for planning-research work;

...when delivering planning tasks to subordinate planning organizations, leave a reserve in the amount of up to 5 percent of the work volume, the wage fund and the material incentive fund, with the right for it to be used throughout the entire period planned.

12. The RSFSR ministries and departments, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms and the Moscow and Leningrad gorispolkoms must develop and present the following lists to RSFSR Gosstroy prior to 1 July 1985:

...of subordinate organizations which are engaged in providing complete planning, the development of special sections of plans, planning projects of a civil housing nature and engineering studies for construction;

...of planning-design offices, bureaus and other subunits, organizations and enterprises which are authorized to carry out the planning work called for in Sub-point "a" of Point 35 in Decree No. 312 of the CPSU Central Committee and the USSR Council of Ministers dated 30 March 1981, and also associated with the surveying of the construction sites for the standard plans of simple buildings

and installations, with mandatory observation of the existing norms and rules for planning and construction.

RSFSR Gosstroy and RSFSR Gosplan must coordinate the mentioned lists with USSR Gosstroy and USSR Gosplan (and particularly engineering-geodetic studies -- also with the Main Administration for Geodesy and Cartography of the USSR Council of Ministers) and present them to the RSFSR Council of Ministers prior to 15 July 1985.

The Russian republic office of USSR Stroybank and the Russian republic office of USSR Gosbank may not finance construction that is based upon planning documentation developed following approval of the mentioned lists by organizations not included in them.

13. The RSFSR ministries and departments, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms, the Moscow and Leningrad gorispolkoms and RSFSR Gosstroy must expand the use of progressive methods and automation equipment for the carrying out of planning work.

Commencing in 1986, the RSFSR ministries and departments, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms and the Moscow and Leningrad gorispolkoms must develop plans for five-year and annual plans for the creation and use in planning of branch (departmental) programming means for computer equipment, automated planning systems and information processing systems and present them to RSFSR Gosstroy.

RSFSR Gosstroy must summarize these materials, coordinate them with USSR Gosstroy and present them to the RSFSR Council of Ministers for approval.

14. The RSFSR ministries and departments, Roskolkhozstroyobyedineniye, the councils of ministers of autonomous republics, krayispolkoms, oblispolkoms and the Moscow and Leningrad gorispolkoms must conduct an inventory of the planning estimates documentation associated with unfinished construction and present the appropriate materials to RSFSR Gosplan, RSFSR Gosstroy and the RSFSR Ministry of Finances prior to 10 April 1985.

RSFSR Gosplan, RSFSR Gosstroy and the RSFSR Ministry of Finances must examine the mentioned materials and, prior to 1 July 1985, present the RSFSR Council of Ministers with the necessary recommendations (coordinated with USSR Gosplan, USSR Gosstroy and the USSR Ministry of Finances) for the obsolete documentation for which no use is planned during the 12th Five-Year Plan.

15. The RSFSR Ministry of Justice, RSFSR Gosstroy and RSFSR Gosplan must prepare, with the participation of the interested RSFSR ministries and departments, and present to the RSFSR Council of Ministers in 1985 a recommendation for introducing changes into existing legislation based upon this decree.

V. Vorotnikov,  
Chairman of RSFSR Council of Ministers

I. Zarubin,  
Administrator of RSFSR Council of Ministers

Moscow, 18 April 1985, No. 163

7026  
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CONSTRUCTION PLANNING AND ECONOMICS

PLANNED CEMENT PRODUCTION GOALS NOT MET

Leningrad TSEMENT in Russian No 3, Mar 85 pp 1-4

[Unsigned article: "Work of the Cement Industry -- At the Level of New Goals"]

[Text] "The first and obvious thing which must be done is the mobilization of efforts and material resources required for the speediest possible reoutfitting of all branches of the national economy, for the rapid productive mastery of the most progressive technologies."

-- K. U. Chernenko, General Secretary,  
Central Committee CPSU, Chairman, Pre-  
sidium of the USSR Supreme Soviet

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The past year, 1984, was a year of constructive work of the Soviet people in the name of the happiness and might of our Motherland, a year of tireless and purposeful struggle of the Communist Party for a solid peace, social progress and a bright future for the people of our planet.

This year was also productive for the personnel of many cement enterprises. As a result of an increase in the work and technological discipline, improvement in use of production capabilities and self-sacrificing work of workers in the branch, cement production was increased in 1984 by 1.6 million tons in comparison with 1983 and according to the USSR Ministry of the Construction Materials Industry was 120.5 million tons; the productivity of labor was increased by 2.5% and in terms of rubles was 23,700 rubles per worker.

The greatest increase in production was on the part of enterprises of Glavzapadtsement (a total of 847,000 tons), the Ministries of the Construction Materials Industry of the Ukrainian SSR and the Estonian SSR.

The cement industry made a considerable contribution to the work achievements of other branches. In four years alone the construction work on the Baykal-Amur Railroad Line was supplied with 2.5 million tons of high-quality bonding material, which favored the laying of the "golden link" of this line ahead of time and the opening up of through working traffic of trains along it. Work

has been done by cement workers at the crossing of the Yenisey at the site of the Maynskaya Hydroelectric Power Station (Krasnoyarsk Kray), in the construction of 113 million square meters of living space and on other projects.

The creative activity of workers and employees of the branch found its expression in the broad scale of socialist competition, at the forefront of which have been the personnel of such progressive enterprise, as the "Akmyantsementas," "Spassktsement," "Volsktsement" and "Yakutpromstroymaterialy" production associations, as well as the Zhigulevsk and Ivano-Frankovsk combines, the Sebryakovsk, Starooskolsk, Lipetsk, Bezmeinsk, Korkinsk, Ulyanovsk, Teploozersk, Karachayevo-Cherkessk, Belgorodsk and Shchurovsk cement plants, and also the "Soyuzspetsremont" trust.

The personnel of these enterprises have responded to the call of the Party in practical ways: a constant increase in the efficiency of production, mastery of intensive management methods and bold introduction of achievements in scientific and technical progress. Their work is characterized by stable and high indices and they are successfully fulfilling the plans and goals of the five-year plan.

For example, the initiator and repeated winner of the All-Union Competition, the personnel of the Lipetsk cement plant, devote much attention to renewal of the main production resources: such as work mechanization, automation of production and introduction of new equipment. During recent years alone the slag drying division and the clay warehouse have been reconstructed here, and because of this the productivity of the chambers for drying the fluidized layer has increased by a factor of 1.5; machines and production lines have been developed for the sorting of depleted grinding bodies and refractory materials; an industrial type automatic control system has been put into operation for the grinding of cement, as a result of which all branches of production have now been automated; the "R-sintering" energy-saving technology has been mastered.

A subject of special concern to the plant management, party and social organizations is the training and placement of personnel, improvement in working and living conditions for the workers. Here the so-called "days of stand-ins" are regularly practiced. On these days the functions of management of sections, shops and the plant as a whole are put into the hands of young specialists who are proving themselves. After such "days" some directors must "go into retirement" and "make way" for younger and more energetic persons.

Recreation rooms have been provided for in all the shops. These have a modern interior. There is a sailing club, splendid recreation area, auditoriums for cultural meetings and sports facilities. Results were not long in coming: in comparison with 1980 cement production increased by 50,000 tons, work productivity increased by 11% and the specific expenditure of fuel on the sintering of clinker was reduced by 2 kg/ton.

For his outstanding achievements in work and his personal contribution to the economical expenditure of raw material, supplies and fuel-energy resources the USSR State Prize for 1984 was awarded to V. D. Platonov, machinist of rotary

kilns at the "Volsktsement" production association.

The workers of the Lithuanian SSR elected Leopold Vladovich Pyatravichus as a deputy to the USSR Supreme Soviet. For many years he headed the personnel at the leading enterprise of the branch: the "Akmyantsement" production association. The high professionalism, demanding attitude on himself and on his subordinates, capable training and placement of personnel, a feeling for what is new and unending concern for improving the working and living conditions for workers in the association, all so characteristic for L. V. Pyatravichus, rightfully earned him the deep respect of the workers of Lithuania and all cement workers. The technical and economic indices of work done by the association considerably exceed the average for the branch. This, without question, is today a model, a "show" enterprise of the branch.

It is necessary to note the appreciable improvement in the work of enterprises of Glavzapadtsement, which produced 257,000 tons of bonding material above the plan and overfulfilled plans with respect to the volume of realization of production, increase in the productivity of labor, profit, etc. The management successfully dealt with the goals relating to the saving of fuel-energy resources, increase in the quality of production and capital construction.

After the serious and correct criticism to which the branch was subjected by Party agencies, work was intensified on the development of cement production by the dry method.

The program for development of the branch during 1986-1990 was worked out thoroughly and with the broad participation of the institutes. This will make it possible to proceed to a radical reconstruction and technical re-outfitting of the cement industry, a renewal of its main industrial-productive resources and a substantial increase in the role of the dry method in the total volume of cement production.

In accordance with the technical specifications of the ministry, the institutes prepared a series of computational-validating materials on the reconstruction of plants. Some of these documents were approved by the board of the USSR Ministry of the Construction Materials Industry and these were submitted to the USSR Gosplan for consideration.

Measures for achieving the planned capacities of production lines in the dry production method are being met at the planned times. In particular, there has been improvement in operation of the production line with a reactor-de-carbonizer with a productivity of 3,000 tons/day at the Krivoy Rog cement-mining combine and it has virtually reached the planned level with respect to cement production.

There has been an increase in cement production by the dry method at the Navoiysk, Novospassk, Lipetsk and Bezmeinsk cement plants.

There is an improvement in the situation with construction of the first line at the Rezinsk cement plant in Moldavia: the builders have the goal of putting it into operation in 1985. The start-up complex has been approved and the necessary funds and material resources have been allocated.

A modern kiln plant has been constructed at the "Novorostsement" combine. It is supplied with cyclone-type heat exchangers, which made it possible to retire from service physically worn out and engineering-wise outmoded shaft kilns, to increase the productivity of labor and to improve its conditions and to reduce by almost 20 kg/ton the fuel expenditure on the sintering of clinker.

Construction of the Araratsk cement plant has begun. It will have two production lines for the dry method for cement production with a total capacity of 2.2 million tons/year.

The principal objectives in work of the scientific research institutes have been defined more precisely and there has been an increase in the efficiency of branch science.

At the February (1984) Plenary Session of the Party Central Committee Comrade K. U. Chernenko, General Secretary, Central Committee CPSU, and Chairman of the USSR Supreme Soviet, emphasized: "It is necessary to make a realistic evaluation of what has been achieved, not exaggerating, but also not under-rating it. Only such an approach will safeguard us from errors in policy, from the temptation to take what we wish for to be reality, and will make it possible to see clearly, as V. I. Lenin said, 'precisely what we have accomplished, and what we have not accomplished'."

Unfortunately, the branch did not meet the 1984 plan and the country was not supplied with 1.6 million tons of cement. The greatest shortages are accounted for by the Ministry of the Construction Materials Industry in the Kazakh SSR, Georgian SSR, Kirgiz SSR, Uzbek SSR and Glavvostoktsement.

A number of subdivisions of the ministry not only did not meet their plans, but also recorded a decrease in the volume of cement production in comparison with 1983. The enterprises of the Ministry of the Construction Materials Industry of the Kazakh SSR, Georgian SSR and Kirgiz SSR worked more poorly than in the third year of the five-year plan.

The number of enterprises not fulfilling the cement production plan was 32 (or 44%). The greatest number is accounted for by the Glavvostoktsement (10 or 43%), the Ministry of the Construction Materials Industry of the Kazakh SSR (5 of 5), Uzbek SSR (3 of 5), Georgian SSR (2 of 2) and Armenian SSR (2 of 2).

Among these enterprises a considerable deficit was chalked up by the "Kara-gandatsement" production association, the Kuznetsk cement plant, the "Mordov-tsement" production association, the Slantsevsk cement plant, the Kantsk cement-slate combine, the Rustavsk and Razdansk cement plants, the "Ahangaran-tsement" production association, the Podolsk and Chernorechensk cement plants. All together they failed to meet the plan by 1.9 million tons of cement.

The reasons for not meeting the plan at these enterprises are different, but to lump them together under one "illness" it would be miscalculations in the organization of labor and production, poor work and production discipline and insufficiency of personnel due to the high turnover. This resulted

in a great amount of idle time and inadequate use of capacity.

For example, at the "Karagandatsement" production association kiln No 1 of the Novokaragandinsk cement plant was shut down in late 1983 for overhaul. Repairs were carried out under a reduced program, at a low organizational-technical level and in the absence of proper control on the part of the plant management. As a result, after repair the kiln operated with long stoppages not visualized in the plan and it was necessary to stop repeatedly for additional repair. The plant was also poorly prepared for the start-up of kiln No 2. And this after the bitter experience with the start-up of kiln No 1, from which the association and the republic ministry, it would seem, should have drawn serious conclusions.

Or another example. During the past year about 200 men of the 1,000 workers were dismissed from the Kuznetsk cement plant. More than 200 workers absented themselves from work with a loss of 1,200 man-days. These figures eloquently indicate that educational work at the enterprise is carried out unsystematically, at a low ideological level.

The absence of strict technological control at the Podolsk cement plant led to clogging of the sludge basins and the sludge lines with solid inclusions, which caused prolonged periods of idle time of equipment not foreseen in the plan. Eighty delinquent workers were recorded at the plant with a loss of 350 man-days. The reason for this was that over the course of a long period of time the plant was in the doldrums. And evidently that is the reason why in the course of everyday concerns its management forgot about the future, forgot to provide the appropriate cultural and living conditions for the workers. The result was a shortage of workers engaged in the main production, a shortage of 50 men by the end of 1984.

And here it is appropriate to quote the words of V. I. Lenin, cited by Comrade K. U. Chernenko, that "A condition for economic development is an increase in the discipline of the workers, the ability to work, speed, intensity of work, its better organization."

As in all the national economy, in the cement industry serious work is being done in increasing work and technological discipline, in strengthening the management link at enterprises and in departments and intensification of exactedness on personnel.

It is sufficient to note that of the 10 most delinquent enterprises enumerated above the directors have been replaced at 7 and the former directors of the Ministry of the Construction Materials Industry of the Kazakh SSR have been severely punished for the unsatisfactory performance of cement plants and the management of the cement industry of the Ministry of the Construction Materials Industry of the Ukrainian SSR has been strengthened.

There is no doubt but that the demands on managers will also increase in the future. A thorough analysis must be made of the situation for each of the remaining enterprises, defining those fundamental measures to be taken along technical and organizational lines, and stubborn and consistent work must be done to ensure success in these directions.

The unsatisfactory work of the branch was also influenced by objective factors. The extreme cold in late 1984 in the eastern and southern parts of the country caused interruptions in the supply of fuel and electric power to cement enterprises. There were also difficulties in the shipping out of the finished product due to the unavailability of railroad cars. But it must be emphasized strongly that it was specifically internal factors which were the most important in the unsatisfactory results of work of the branch in the fourth year of the 11th Five-Year Plan.

Among the serious shortcomings of work of the cement industry in 1984 one must also include nonfulfillment of the goals set in the plan for the development of science and technology with respect to increase in the indices characterizing the technical level of production, and in particular, with respect to an increase in the percentage of the dry method in the total volume of cement production and reduction in the specific consumption of fuel in the sintering of clinker.

However, despite the mentioned shortcomings, a change to the better in the branch could be noted. It is only necessary to strengthen this, taking some concern primarily about upgrading the management of enterprises, about reconstruction and technical reoutfitting of the plants for the purpose of introducing energy-saving technologies and renewal of basic facilities, about increasing the influence of branch science on raising the technical level and efficiency of production.

It is precisely on solution of these problems on which the cement industry is oriented in 1985, the final year of the five-year plan.

The rates of increase in the economic indices set by the plan will be higher than the average for the last four years.

The volume of cement production at the enterprises of the USSR Ministry of the Construction Materials Industry must be increased to 123.7 million tons or by 3.2 million tons (2.6%) greater in comparison with that attained in 1984. It is planned that the greatest increase in production will be obtained at the enterprises of the Ministry of the Construction Materials Industry of the Kazakh SSR, Glavtsement (1,069,000 tons) and the Ministry of the Construction Materials Industry of the Uzbek SSR.

A still more strenuous goal has been set in the plan with respect to increase in the production of clinker. A total of 97.5 million tons must be produced, which is 3.7 million tons (3.9%) more than in the preceding year.

In order to ensure the production of cement and clinker in the planned volumes the use of already existing production facilities must be raised to 95%. Not less than 93% of the total increase in production is to be realized by an increase in the productivity of labor by 1.4%.

Thus, the plan for 1985 provides for a further rise in intensification, an improvement in the technical level of production and maximum use of production potential.

Attention to a regime for economizing fuel and energy resources is being intensified. For example, the specific expenditure of fuel on the sintering of clinker must be reduced for the branch as a whole to 220.5 kg/ton, which is 2 kg/ton less than the expenditure in 1984. A total of 36% of the additional need for fuel must be met by fuel savings. In addition to a savings due to a lowering of the norms, which should be 188,200 tons of conventional fuel, the plan provides for an additional decrease in fuel consumption by 40,000 tons by a reduction of its loss in storage, a reduction of transient surpluses (reserves) and an improvement in the variety and quality of production.

The meeting of goals with respect to economy and additional reduction in the consumption of fuel and electric power requires the working out for each enterprise of special plans or measures providing for the introduction of energy-saving technologies, an improvement in technological discipline, mechanization and automation of production.

In these plans particular attention must be devoted to the two principal factors determining fuel economy: the development of cement production by the dry method and a reduction in the moisture content of sludge.

The plan calls for an increase in the role of the dry method in the total volume of cement production to 16.4% versus 14.8% in 1984. In order to meet this goal the production of cement using this technology must be increased in comparison with the past year by 2.4 million tons, which is 76% of the total increase in cement production. This is an extremely difficult problem whose solution is possible only by employing the production capacities of enterprises using the dry method at the 97% level. Accordingly, the Novokaragandinsk, Kuznetsk and Slantsevsk plants must considerably increase cement output.

An increase in the quality of production and an improvement in variety must be regarded as the central objectives.

The average grade of cement must be increased to 409 and the percentage of production certified by the State Symbol of Quality must be increased to 35.3%.

Unfortunately, it must be stated that stress on the field of economizing of material resources has led to some weakening in control over increase in the quality of production. This has resulted in the shipping to users of cement of an unsuitable quality, a number of enterprises have lost the State Symbol of Quality for some types of production and penalties have been imposed for failure to adhere to the guaranteed grade.

Accordingly, there is a need for a further strengthening of technological discipline, an increase in responsible action by the principal production shops, technical control divisions and laboratories of enterprises for the quality of production, bearing in mind that it is precisely a high quality of cement and stability of its construction and technical properties which will give an enormous savings in fuel and energy resources in the national economy.

A provision is being made for a decisive development of production of efficient types of product. The output of cement grade 500 should be increased

by 3.0%, grade 550 -- by 9.4% and grade 600 -- by 10.5% and their total percentage in overall volume of production must be raised to 21.7%.

In the immediate and more distant future a factor of great importance for the work of industry will be realization of a plan for capital construction. For the branch as a whole the capital investments in industrial construction have been set in the amount of 193 million rubles, including 111 million rubles for construction and erection work, of which approximately 40% will be directed to the reconstruction and technical reoutfitting of enterprises.

In the field of capital construction the principal goal is the construction and starting up of the first production line with a capacity of 1,150,000 tons of bonding material annually at the Rezinsk cement plant in the fourth quarter of 1985. In order to achieve this goal the builders must triple the rates of construction and erection work and during the year execute capital construction valued at 35 million rubles.

The meeting of the goals for the fifth year of the 11th Five-Year Plan and the laying of the necessary basis for the 12th Five-Year Plan require, as noted at a session of the Politburo of the Central Committee CPSU on 15 November 1984, an increase in the rates of renewal of production facilities on the basis of achievements in science and technology. Unfortunately, during the last 10 years this index in the cement industry has fallen sharply and this has led to the active ageing of the main facilities. The 1985 plan calls for putting on line new basic production facilities in a volume of about 150 million rubles, which is 3.5% of their total cost.

There is a need for seeking out additional possibilities for increasing capital investments for the technical reoutfitting and reconstruction of enterprises, providing them with equipment and with limits or contract work.

At the center of all plans must be concern about man and his increasing material and spiritual needs. The social provisions of the plan provide for the construction of residential facilities with a total area of 93,000 m<sup>2</sup> (only at enterprises under union jurisdiction); dispensaries at the Podgorensk cement plant, at the "Mikhaylovsktsement" and "Sukholozhskstsement" associations; kindergartens at the Savinsk and Yashkinsk cement plants; pioneer camps at the Karachayevo-Cherkessk cement plant and at the "Voskresensktsement" production association, etc.

Work must be continued on increasing the output and improving the quality of goods for commercial purposes and for improving the standard of living. About 8,000 tons of cement must be packaged into paper and polyethylene bags containing 5 kg each and supplied to the retail trade outlets. In this line of endeavor it is necessary to implement a proposal made by NIItsement and the "Voskresensktsement" production association that the small packaging of cement be accomplished using carousel-type 14-outlet machines by the realinement of one outlet pipe. An agreement has been reached with the Novolyalinsk cellulose and paper combine on the fabrication of four-layer flap-type paper sacks holding 5 kg each. The search for machines and automatic equipment for the small wrapping and packaging of cement is continuing. For this purpose a stand has been devised at the experimental plant of NIItsement (director T. D. Gorbachev)

for the perfecting and testing of Soviet-produced and imported automatic equipment for the packing of cement in small containers.

The plan for the development of science and technology for the branch provided for the widening of use of such resource-saving technologies as the production of cement by the dry method with use of kilning apparatus supplied with reactor-decarbonizers; production of analite cement on the basis of a low-temperature (saline) technology; increase in the production of high-strength cement with use of superplasticizers and resilient cements, etc.

The personnel of the enterprises on which these tasks are imposed bear a great responsibility. Their work is of exceptionally great importance for the future development of the cement industry. Among such enterprises are the Sas-Tyubinsk plant, which is mastering the first industrial line on the basis of the technology proposed by the Council for Science and Technology; the "Akhangarantsement" production association, which must change a line with a kiln measuring 4.5 x 170 m to this technology; the Sebryakovsk plant, the "Volktsement" production association, the Amvrosiyevsk and Balakleysk combines, introducing the energy-saving technology of high-strength cements with use of superplasticizers, the Krivoy Rog combine and the Katav-Ivanovsk plants, mastering systems for the preliminary decarbonization of raw materials, and others.

The branch institutes play a significant role in implementing the plan for the development of science and technology. During 1985 they will continue fundamental research providing a scientific basis for the 12th Five-Year Plan and the more distant future, as well as work on the realization of national and branch scientific and technical programs.

The final year of the 11th Five-Year Plan is the 40th anniversary of the victory of the Soviet people in the Great Fatherland War and the 50th anniversary of the Stakhanovite movement, the year of the 27th Congress CPSU. For all workers in the cement industry may it be a year of new work triumphs and creative accomplishments, a year of solid peace. May it bring happiness and joy to every work group, each Soviet family.

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CONSTRUCTION PLANNING AND ECONOMICS

CONSTRUCTION MINISTRIES PROPOSE EXPERIMENT WITH TURNKEY PROJECTS

Moscow "VULLETON NORMATIVNYKH AKTOV MINISTERSTV I VEDOMSTV SSSR" in Russian No 6, Jun 85 pp 29-35

[Decree No LB-62-D approved by USSR Gosplan, USSR Gosstroy, USSR Goskomtrud, USSR Ministry of Finance, and USSR Construction Bank on 12 November 1984: "Decree on Experimental Construction of a Number of Projects According to Plans and Estimates Mutually Agreed upon by the Customer and Contractor and to Be Handed over on a Turnkey Basis, Extension of the Independence of Construction Organizations, and an Increase in the Responsibility of Participants in Construction"]

[Text] 1. This regulation was drafted in accordance with Decree No. 387 of 29 April, 1984, from the CPSU Central Committee and the USSR Council of Ministers, entitled "Improving the Planning, Organization and Management of Capital Construction," which is to be implemented as an experiment in the construction of industrial facilities, apartment buildings and retail stores and offices on the basis of turnkey plans and estimates mutually agreed upon by the customer and the contractor,\* and provides for greater independence and responsibility on the part of construction organizations as well as greater responsibility on the part of customers involved in construction, planning organizations, and manufacturers and suppliers of equipment and materials at all stages of the investment process, from the development of estimate and design documentation to the placement of facilities in service.

2. The experiment's purpose is to develop under the industrial conditions of the system measures which will ensure on-schedule construction of industrial facilities, shorter construction time, firm construction estimates, greater efficiency in the construction industry by accelerating labor productivity increases, the economic allocation of equipment and materials, acceleration of the implementation of scientific and technical advances and intensification of production.

The experiment will be carried out in 1985 in the construction organizations under Glavsruduralstroy of the USSR Ministry of Heavy Construction, Glav-srednevolzhskstroy of the USSR Ministry of the Construction Industry, Glavzap-

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\*The "experimental construction of a number of industrial facilities, apartment buildings and retail stores and offices on the basis of turnkey plans and estimates mutually agreed upon by the customer and the contractor" shall be referred to hereafter as the "experiment."

stroy of the USSR Ministry of Construction, the Byelorussian Ministry of Industrial Construction and the Byelorussian Ministry of Rural Construction."\*

3. This regulation defines the basic issues related to the execution of the experiment, which is intended to improve relationships among construction organizations, from drafting estimate and design documentation to placing facilities in service; improve planning of the economic and production operations of the central boards and ministries (i.e., the parties taking part in the experiment); develop economic incentives and self-supporting projects; and improve the supply of equipment and materials to the construction industry.

4. The Interdepartmental Turnkey Construction Experiment Commission at the USSR State Planning Committee (Gosplan) will provide over-all coordination of the experiment and resolve any methodological issues that arise.

5. The USSR Ministry of Heavy Construction, the USSR Ministry of the Construction Industry, the USSR Ministry of Construction, the Byelorussian Ministry of Rural Construction and the Byelorussian Council of Ministers will:

Draft and submit, for the approval of the Gosplan Interdepartmental Commission on the Supervision of Experimental Construction, methodological guidelines for the implementation of the experiment by subdepartments of the central boards and ministries participating in the experiment;

Provide supervision of the implementation of the experiment and methodological and practical assistance to the central boards and ministries participating in the experiment; and

Submit annual reports by 1 April to Gosplan's Interdepartmental Turnkey Construction Experiment Commission on the results of the experiment.

6. The following parameters, ceilings and economic standards shall be approved in social and economic development plans drafted by the central boards and ministries participating in the experiment:

**Five-Year Plans:**

Placement of industrial units and facilities in service;  
Total construction and assembly contract jobs performed with in-house resources, itemized by customer (estimated);  
Productivity increase;  
Maximum cost per ruble of construction and assembly work (estimated);  
Ceilings for State capital investment in construction and assembly work and placement in service of equipment and industrial units and facilities (itemized by individual capital construction project).

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\*"Glavreduralstroy of the USSR Ministry of Heavy Construction, Glavrednevolzhskstroy of the USSR Ministry of the Construction Industry, Glavzapstroy of the USSR Ministry of Construction, the Byelorussian Ministry of Industrial Construction and the Byelorussian Ministry of Rural Construction" shall be referred to hereafter as "the central boards and ministries taking part in the experiment."

**Annual Plans:**

Placement of industrial units and facilities in service;  
Total commercial construction [tovarnaya stritel'naya produktsiya] performed;  
Total number of construction and assembly contract jobs performed with in-house resources, broken down by customer (estimated);  
Productivity increase;  
Standard wage per ruble of total construction and assembly work contracted;  
Profits earned from contract operations;  
Maximum cost per ruble of construction and assembly work (estimates);  
Standard deductions from revenue from all operations to be retained by the central board and ministry taking part in the experiment;  
Goals for implementation of new technology and scientific organization of labor;  
Total materials, machinery, devices and other material and technical resources required to fulfill the plan;  
Standard allocation to economic incentive fund; and  
Standard scientific and development fund.

Individual central boards and ministries may utilize additional parameters for basic operations.

A listing of the parameters, ceilings and economic standards to be approved in annual and five-year plans for construction and assembly organizations and subdepartments of central boards and ministries taking part in the experiment shall be drawn up by the latter.

Current plan parameters shall remain in effect for other operations being performed by central boards and ministries taking part in the experiment.

7. Five-year plans shall be drafted by the central boards and ministries and subordinate construction and assembly organizations on the basis of control figures and economic standards provided by the corresponding higher office, the customers' proposals for placing industrial units and facilities in service and proposals for total construction and assembly work.

8. In approving the annual volume of construction and assembly contract work under the five-year plan, the USSR Ministry of Heavy Construction, the USSR Ministry of Industrial Construction, the USSR Construction Ministry and the USSR Ministry of Rural Construction shall consider up to ten per cent of the total capacity of central boards and ministries as the latter's reserves available for improving the balanced correlation of annual plan indicators.

9. The formulation of tasks in annual plan drafts related to the placement of industrial units and facilities in service and the determination of total commercial construction work and construction and assembly services to be contracted shall be accomplished by the central boards and ministries taking part in the experiment and their subordinate construction and assembly organizations, utilizing parameters for the year in question of the five-year plan, taking into account the pace of construction, itemized lists of construction projects about to be completed, and customers' proposals for new construction.

Simultaneously with the formulation of tasks related to the placement in service of industrial units and facilities for a given plan year, tasks for the following year shall also be drafted and broken down into six-month periods.

Enterprises and customer organizations shall submit proposals to construction and assembly organizations, central boards and ministries, following procedures laid down by Gosplan, on placing industrial units and facilities in service for the given plan year and the following year, total high-priority commercial construction and total construction and assembly work to be contracted by 1 March and all general projects for the preceding year by 1 April. The high-priority project list is to be approved by the USSR State Planning Committee.

By 10 April of the preceding year, central boards and ministries involved in the experiment shall submit figures to their respective superior offices in the union republic construction ministries on the capacities of construction and assembly organizations for the year being planned and recommendations on improving the accuracy of total construction and assembly work to be contracted in the plan year under the five-year plan (in accordance with construction-time standards) as a whole and by customer as approved by local soviet organs.

By 20 April of the preceding year, the USSR Ministry of Heavy Construction, the USSR Ministry of Industrial Construction, the USSR Construction Ministry and the USSR Ministry of Rural Construction shall approve the capacity figures for construction organizations under the central boards and ministries taking part in the experiment, and, with Gosplan's approval, determine total construction and assembly work to be contracted as high-priority projects. The central boards and ministries, together with the customers, shall determine the remaining construction and assembly work to be contracted.

Annual plans for the central boards and ministries taking part in the experiment must be approved by the proper ministry and delivered to the organizations performing construction and assembly work no later than 1 November of the preceding year.

10. Beginning in 1985, as a general rule, the construction of all new apartment buildings shall be done under experimental guidelines, and industrial and retail stores and offices shall be built according to the list of construction projects approved by the customers and central boards and ministries taking part in the experiment.

In turnkey construction, (a) the prime contractor shall be responsible for on-time completion of all construction and assembly work and the first production run at industrial projects as well as on-time readiness for operation or full-scale business in the case of retail store and office projects; (b) subcontractors shall be jointly responsible with the prime contractor for the execution of all specialized work and placement in service of facilities; and (c) customer enterprises and organizations shall be responsible for the on-time installation of all equipment at enterprises as well as bringing the latter up to rated capacity.

Finished turnkey construction projects shall be completed by the contractor and the customer as stipulated in Decree No. 105 of 23 January, 1981, by the USSR Council of Ministers.

11. Central boards and ministries taking part in the experiment, through their respective design and procurement organizations and orders placed by design and procurement organizations in other departments and ministries (upon the customer's submission to these organizations of the total services to be performed by design and procurement organizations) shall draft the construction section of working documentation.

The estimated cost of construction and assembly work, as given in the working plan and duly approved by both the customer and the contractor shall become the final contractual price.

The contractual price of the construction and assembly work shall be used to determine total construction and assembly services in itemized lists, commercial construction planning and contract work, as well as the payments to be effected to the central boards and ministries by the customer.

If there is an overrun beyond the contractual cost for construction and assembly work on a given project, additional costs shall be charged to the construction and assembly account of the central board or ministry involved.

Any savings in construction obtained by reducing the cost below the contractual price for construction and assembly work shall be made available to the construction and assembly organizations involved. Savings are to be obtained by effective design and real reduction of the cost of construction and assembly work.

Design savings are defined as the difference between the contractual price for construction and assembly work and the estimated cost of the same work as determined in estimates based on blueprints.

At the discretion of central boards and ministries taking part in the experiment, the distribution of design savings may be effected in accordance with the "Methodological Regulations on Carrying out Experiments Designed to Reduce Material and Labor Costs and Estimated Construction Costs," approved by a resolution adopted on 15 July, 1982, by the USSR Gosplan Interdepartmental Commission on Matters Concerning the Application of New Planning and Savings-Incentive Methods (Protocol No. 386).

12. The prime capital construction contractual agreement shall be negotiated between the construction and assembly organization (prime contractor) of a central board or ministry taking part in the experiment and the customer for the entire construction term (if the construction term exceeds one year, the contract shall stipulate annual goals). Contracts shall not be negotiated annually. Additional agreements may be negotiated as required.

If the customer delays submission to the prime contractor of documentation required to negotiate the prime contractual agreement and fails to comply with other provisions, thus causing a breakdown in contract negotiations prior to 1 January of the year being planned, the prime contractor shall be entitled to refuse to negotiate the contract. In this event, the prime contractor may remove from the plan all new construction to be undertaken with an estimated cost of less than four million rubles, and the issue of whether to build projects with an estimated cost of four million rubles and above shall be reviewed by the customer ministry and the construction ministry involved in order to set

new dates for the initiation of construction and contract negotiations. If required, the new construction terms will be approved by the USSR Gosplan or set forth in a resolution by the USSR Council of Ministers. These changes must be taken into account in the plan.

In order to increase the responsibility of subcontractor organizations (outside organizations as well as the prime contractor's affiliates) for fulfilling construction assignments, these organizations are required to be involved in the approval of estimate and design documentation, the drafting of the contractual work plan and the review of documents providing for the delivery of construction equipment.

13. Credit for unfinished construction and assembly work performed by central boards and ministries taking part in the experiment shall be allowed, regardless of whether the customer has paid. Credit for unfinished construction shall be accumulated at the USSR Stroybank.

14. Central boards and ministries taking part in the experiment shall perform operations on a full cost-recovery basis, deducting from revenue all planned expenses, including the cost of setting up an industrial construction base, utilization of the latest scientific and technical advances and economic incentives.

The amount of revenue to be retained and the amount to be paid into the State budget by the central boards and ministries taking part in the experiment shall be determined by annual plans in accordance with approved guidelines.

The guidelines for determining the amount to be retained from revenues by the central boards and ministries taking part in the experiment will be determined by the procedures set forth in "Methodological Directives for the Continued Improvement of Industrial and Economic Operations of the Byelorussian SSR Ministry of Industrial Construction and the Increased Importance of Economic Methods in said operations as approved by the USSR Gosplan Interdepartmental Commission on Matters Concerning the Application of New Planning and Savings-Incentive Methods on 16 October, 1975 (Protocol No. 317b, Section II) and confirmed by the USSR Ministry of Heavy Construction, the USSR Ministry of Industrial Construction, the USSR Construction Ministry and the USSR Ministry of Rural Construction. Interest on bank credit extended to cover the cost on unfinished construction and assembly work shall be paid out of revenue as it becomes available.

15. The cost of replacing the equipment pool of construction and assembly organizations under the central boards and ministries taking part in the experiment, payable out of production development and bank credit funds, and funds allocated for the construction of non-productive facilities against the account for social and cultural services and residential construction shall be reviewed by these organizations in the context of State capital investment and shall be listed separately in the plan as non-centralized capital investment.

These organizations shall individually decide how to use the funds for social and cultural services and residential construction, keeping in mind that the end use of these funds must be discussed and approved by labor collectives.

Moneys accumulated by these organizations in production development and social and cultural service and residential construction funds (specifically including funds allocated for the construction on non-productive facilities) may not be withdrawn.

The execution of services in full against these accounts is provided for in the plan for contract work and the same material and technical support is given as for centralized State capital investment.

16. Construction and assembly organizations of central boards and ministries taking part in the experiment will be fully supported with material and technical resources in conformity with estimate and design documentation.

Regional offices of the USSR State Committee for Material and Technical Supply will provide guaranteed funds monthly to these organizations as stipulated in the economic agreements signed with said organizations.

The material responsibility of enterprises to render services within the production system of the USSR State Committee for Material and Technical Supply, and of construction organizations, enterprises and other entities performing services with delivery deadlines, incomplete services, failure to comply with the agreed schedule and other infractions is defined in the "Regulations on the Performance of Industrial and Technical Services" as approved by Resolution No. 161 of the USSR Council of Ministers on 10 February, 1981.

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## MINISTER SOLOVYEV ON INTENSIFIED INDUSTRIAL CONSTRUCTION

Moscow EKONOMIKA STROITELSTVA in Russian No 7, Jul 85 pp 3-11

[Article by Yu. F. Solovyev, USSR Minister of Industrial Construction: "Intensification of Production - A Matter For Each and Every One"]

[Text] Major and responsible tasks related to preparations for the 27th Congress CPSU stand before builders, who will play a key role in implementation of the program for economic and social development of the country. Through their efforts there is a continuing increase in the productive resources of the national economy, technical re-outfitting and reconstruction of already operative enterprises, new construction and renovation of housing and projects for increasing the standard of living. All this will assist in solving the problem of a further increase in the efficiency of production and an enhancement of the national well-being.

During four years of the Eleventh Five-Year Plan the construction organizations of USSR Ministry of Industrial Construction have put into operation more than 1,000 production facilities and complexes listed in the State Plan, have constructed housing units with a total area of more than 53 million m<sup>2</sup>, schools with 460,000 seats for students, a great number of kindergartens, hospitals, polyclinics and projects erected in accordance with the Food Program.

At the same time it must be admitted that the ministry still has not done all that is necessary to ensure stable implementation of the State Plan. During the first years of the Eleventh Five-Year Plan there was virtually no increment in the volumes of construction-erection work in comparison with 1980. During the last two years the situation has somewhat improved. The work volume has increased by 440 million rubles, but this increase has not ensured implementation of the planned goals. The finalization of production facilities and projects provided for in the plan also has not been fully realized. As before, there has been a great volume of uncompleted construction work, there has been a decrease in profitability and some organizations of the ministry are continuing to work at a loss.

The ministry has carried out a thorough analysis of the production and economic activity of construction organizations and has sought out and analyzed existing shortcomings in detail.

Attention was directed first and foremost to serious omissions in the organization of construction, work of brigades, existing disruptions in work, production and technological discipline. The presence of these inadequacies leads to considerable intrashift time losses, nonproductive expenditures of labor and

material resources caused by disruptions in the technology of production, additional work on the construction site in finishing items and construction parts furnished by the industrial enterprises themselves.

Working under approximately identical conditions, some trusts steadily meet their earning goals and have brought it to the level of 13,000-14,000 rubles per worker, whereas others have earnings of 7,000-8,000 rubles per worker, remaining virtually in the same place. This occurs to a different degree because work on the adoption of the leading experience of the best organizations is pursued with insufficient purposefulness and consistency.

Here, for example, is a case in point. The Ministry of Industrial Construction of the Ukrainian SSR during four years of the Eleventh Five-Year Plan ensured an increase in the volumes of construction-erection work performed without an increase in the number of workers and the increase in the productivity of labor during the mentioned period was 17.3%. In 1984, simply due to an increase in the productivity of labor, the ministry ensured an increase in the volume of construction-erection work by 81.5 million rubles; the decrease in the cost of the work done in the four years was 19.9%. The Belotserkov and Kharkov house construction combines, as well as the Ukrpromspetsstroy combine, carried out their missions ahead of time with respect to all production, technical-economic and financial indices set by it in the four years of the Eleventh Five-Year Plan. The earnings per worker in a brigade operating by contract were 115% in comparison with the earnings in ordinary brigades. However, this work experience was not shared with other groups of personnel.

The work shortcomings of a whole series of organizations were also related to the unsatisfactory state of some industrial enterprises in the construction industry, inadequate capabilities for accomplishment of individual types of projects and incomplete correspondence between the available numbers of construction machines, mechanisms and vehicles to the structure and volumes of work done.

The ministry annually produces 21 million cubic meters of reinforced concrete, 33 million cubic meters of nonmetalliferous materials and 9 million square meters of joining work. However, it is not always possible to satisfy completely the needs of construction organizations with respect to the quantity, quality and technical level of a number of items, construction components and materials. This is attributable to a considerable degree to the fact that the technical state of many enterprises in the construction industry does not correspond to present-day requirements. The time has come to be seriously concerned with matters of technical re-outfitting of the existing main construction machines and transport vehicles. Indeed, it is no secret that almost 30% of the main construction machines have arrived near the end of their useful service. There is a shortage of very powerful machines. There is a shortage of manual and especially electrified tools at construction sites.

Great reserves were found to exist in work on increasing the skills of workers and keeping skilled workers on the job and everywhere establishing the required conditions for the work and living of construction workers. At a whole series of organizations at which due attention is given to these matters, the

results of work are considerably better. For example, a brigade of fitters of the SU-4 Kuybyshev house construction combine of the Glavsrednevolzhskstroy, headed by A. P. Sotnikov, over a long period has ensured a mean daily output of up to 5.17 square meters of useful housing area per day. The brigade of fitters headed by A. D. Yelizarov in the housing construction combine of the Tulgorstroy Construction Administration of the Glavpriokskstroy has achieved a productivity of 5.68 m<sup>2</sup> per worker. The brigade of bricklayers headed by V. Ye. Kesler from SMU-2 of Trust No 2 of Glavomspromstroy each day produces 3.3 m<sup>3</sup> of bricklaying per worker. A brigade of painters headed by N. S. Mamontova from the SU of the construction section of Glavpriokskstroy has achieved a mean daily output of 67.7 square meters of painted surface per worker.

Skilled bodies of workers and brigade leaders who have undergone the good school of work in construction, the high level of responsibility and conscientiousness of most line engineering and technical workers, the engineering and technical personnel at the headquarters of the trusts, the forming of stable work teams in organizations, relying on traditions ensuring meeting of the planned goals: this is the basis which can and must exert a decisive influence on an increase in work productivity, particularly necessary under the conditions of the demographic situation now prevailing.

At the April (1985) Plenary Session of the Central Committee CPSU it was noted: "The task of accelerating the rates of growth, a substantial increase, is entirely practicable if an intensification of the economy is placed at the center of all our work, if administration and planning, the structural and investment policy are revamped, if good organization and discipline are increased everywhere and if there is a radical improvement in the style of activity. This program goal of our Party has found embodiment in the comprehensive program "Intensification of Construction work-90," now formulated by the USSR Ministry of Industrial Construction with the participation of scientific research, design-technological and planning institutes, as well as construction organizations, providing for a considerable increase in the organizational and technical level of construction. The comprehensive program consists of 12 special-objective programs: "Engineering Preparation," "Progress," "Construction Industry," "Reduction of Manual Labor," "Contracting," "Personnel," "Mechanization," "Transport," "Economy and Efficient Use of Material Resources," "Management and Economics," "Quality Control" and "Science."

These special-objective programs reflect the principal directions in the intensification of construction work: increase in the productivity of labor, reduction in the cost of construction-erection work, economy of material resources, reduction in the duration of construction, preferential development of mechanization and transport of enterprises in the construction industry on the basis of their reconstruction and technical re-outfitting, increase in the quality of the work done, etc. with specific goals and indices for each construction organization of the ministry.

The program-objective method has long been used in the ministry. Objective programs were developed in the USSR Ministry of Industrial Construction for

the Tenth and Eleventh Five-Year Plans. But in contrast to them, in the development of the new program use was made of a different approach in defining long-range goals.

First, and I would like to bring attention to this, even the very name given to the program contains two key words -- comprehensiveness and intensification, which reflect its essence.

The comprehensiveness of the program is ensured by the range of problems with which it deals: improvement in preplanning and planning work, when the objective is not rationalizing and changing already drawn-up plans, but in the stage of their development progressive technological solutions, work- and energy-saving construction elements are incorporated in them; development of enterprises in the construction industry, mechanization and transport; improvement in the control of the intricate construction complex; serious improvement in the organization of production and work; rise in the level of economical work. A special place in the program is allocated to measures for forming stable skilled bodies of construction workers, improvement in working and living conditions, enhancement of creative initiative in work groups, development of forms and methods for their participation in the control of production and universal strengthening of technological, production and work discipline.

But the most important consideration on which the comprehensive program is based is a clear-cut course for intensification, assurance of all the increase in volumes of work without an increase in the number of workers, a marked increase in the productivity of labor. The goal here is not only the exploitation of reserves of an organizational-economic and social character, but primarily stress on the acceleration of scientific and technical progress, an increase in the role of the new methods and equipment, computers, use of robots and manipulators. The preponderant part of the planned increase in the productivity of labor is to be ensured by factors determining scientific and technical progress.

In this connection, the comprehensive program includes the "Science" program, whose function is a scientific foundation for the programs and in which there is a section devoted to long-range research and development, ensuring out-front development of scientific research.

There is an increasing number of scientific research and technological design organizations with which the ministry will cooperate; the volume of scientific research, experimental design and technological design work is considerably increasing.

The measures developed for the intensification of construction work in the course of preparation of the comprehensive program can be grouped into five main categories.

The first category includes measures for increasing the effectiveness of use of the work and material-technical resources at the disposition of construction organizations, as well as the resources of construction industry

enterprises, construction machines on hand, mechanisms and transport. Measures in this direction have found reflection in the special-objective programs "Engineering Preparation," "Contracting," "Mechanization," "Transport," "Reduction of Manual Labor in Construction." They should ensure the overwhelming majority of the increase in the productivity of labor and all the mentioned reduction in the duration of construction of industrial complexes. The realization of the measures provided for by this direction almost does not require additional capital investments.

It is planned that the projected result be ensured primarily by a sharp reduction in the intrashift losses of work time and unproductive expenditures of labor, a decrease in the number of workers engaged in manual labor in construction, an increase in real earnings from the basic types of work, an improvement in the use of construction machines, a decrease of the fraction of transport expenditures in the cost of construction-erection work.

The measures take in a broad range of matters, beginning with improvement in engineering preparations for production and an increase in the demands on subdepartmental organizations, enterprises and client organizations and planning institutes in the stage of preparation for construction.

In our opinion, there are considerable reserves for increasing the productivity of labor in construction, in correctly adopted planning decisions to which construction organizations should give special heed upon receipt of technical documentation. For example, an analysis of a whole series of plans for industrial projects has indicated that there is a relatively high (up to 80%) prefabrication of frames and outer walls of buildings but the prefabrication of inner walls, partitions, built-in rooms and energy units does not exceed 20-30%.

The special-objective program charges each construction organization with the obligation, already beginning in 1985, to reach agreement with planning organizations prior to beginning of planning of projects on the use in them of progressive construction components and materials and must ensure the maximum prefabrication of all parts of buildings, a sharp reduction in "wet" processes and the use of small-piece materials. Plans call for a maximum decrease in the use of bricklaying on projects with its replacement by concrete and reinforced concrete blocks and panels; broadening of the practice of erection of small buildings and structures by the "block assembly" method and the replacement of plastering and painting work on projects by sheet materials not requiring finishing. The program provides for the virtually complete exclusion of earthwork which at the present time is carried out manually by the use of bulldozers, small excavators, pneumatic tamping, etc. in trimming the surface down to the designated level.

In the implementation of this part of the comprehensive program serious requirements are imposed on the chief engineers of the trusts and construction-erection administrations, on the engineers of production and technical divisions. Experience with such work has accumulated in the organizations of the ministry.

An example of fruitful cooperation of builders with planning organizations in reducing the expenditure of material and work resources is an experiment carried out by the Ministry of Industrial Construction of the Belorussian SSR. In the course of the experiment on projects for which stable prices have been set, the planning documents are worked over with allowance for recent advances in science and technology. During 1983-1984 the construction organizations of the Ministry of Industrial Construction of the Belorussian SSR, by means of improvement in work with planning organizations, achieved a saving of 1,627 tons of metal, 3,210 tons of cement and the total savings were 2 million rubles.

At all the construction trusts provision is made for the introduction of a system for working out annual plans for work, balanced with work and material resources, with extensive use of electronic computers. Major industrial complexes will be built on the basis of the unit method, with a substantial increase in the construction of housing by the Orlov "continuous" method. There should be broad development of model-showcase construction with the use of advanced Soviet and foreign experience, for which in each territorial subdivision plans call for model-showcase construction projects and model-showcase organizations.

Experience in the organization of model-showcase construction in projects of the Gomelpromstroy Association of the Ministry of Industrial Construction of the Belorussian SSR and the Ministry of Industrial Construction of the Azerbaijan SSR indicated its high effectiveness. Most of the constructed projects were put into use ahead of time and with a good quality of work. The basis for this was a careful, competently implemented engineering preparation. In the planning documentation use has been made of the latest advances in science and technology, progressive design solutions, in the construction process making it possible to use efficient work organization methods. In factory construction use has been made of the unit method of planning, preparation for, organization and control of construction; joint erection of the frames of buildings and installation of technological equipment; "conveyor"-unit installation of wall panels and roofing slabs of buildings and much else. All this made it possible to reduce the expenditures of labor, cost of the work and shorten the duration of construction.

In the immediate future model construction projects and construction organizations will become a real school for the popularizing of progressive, model construction methods.

The directors of trusts must consider how to ensure the mastery of these methods by all engineers and technicians, and especially by line engineering and technical personnel.

Due to the improvement and development of services (administrations) with combined production and technological functions provision is being made for bringing in order, in the immediate future, complete preparation of and delivery of material resources to brigades in containers, packets and on flatbeds in accordance with the technological stages of the work.

An increase in the level of engineering preparation for construction and improvement in completeness in provision with material resources should be the basis for large-scale introduction and increase in the effectiveness of brigade contracting, including by the continuous flow method. Here brigadiers, masters, work superintendents and heads of construction units have their role to play. In their hands they have the powerful tools for this intensification: work organization and its stimulation.

There are more than a few examples of effective work by the brigade contracting method in the USSR Ministry of Industrial Construction. The Kherson house building combine, in organizing enlarged through-production brigades consisting of up to 80 men, made up of specialized groups ensuring a considerable shortening of construction of housing by the continuous flow brigade contracting method, without compromise in work quality, has high marks for such work. The experience of SU-23 of the Kharkovpromstroy combine with the planning-calculations method of accounting for and evaluating the activity of workers by the brigade contracting method when constructing new and reconstructing existing enterprises merits widespread popularization. The task of the directors of organizations is to see that this advanced experience is put into practice at the construction sites of the ministry.

Measures in the program provide for a substantial increase in the level of comprehensive mechanization of construction and erection work by means of an improvement in the system for the operation of mechanisms, the concentration of the available numbers of large construction machines in mechanization trusts and administrations, an increase in the level of centralized repair, a considerable increase in the assembly-unit repair method and the replacement of obsolescent machines.

The objective program also provides for measures for improving the use of transport and reduction of the fraction of transportation expenditures in the cost of work and completed production. It is planned that this be achieved due to improvement in the structure of available railroad cars, replacement of motor vehicles which have been in service more than 8 years, construction of specialized rolling stock, an increase in the percentage of centralized shipment, container and packet shipping, shipping of freight on trailers and a marked reduction in layovers of railroad cars during loading operations which are above the norm.

The realization of the above is a matter of honor of work organizations, each worker in trusts and mechanization administrations and truck transport enterprises whose activity must be directed to the final result of construction: the putting into operation of production facilities and objects, an increase in the productivity of labor.

The second direction in the comprehensive program brings together measures for increasing the industrialization of construction on the basis of use of the latest progressive types of construction components and items with a high degree of factory finishing. Considerable attention will be devoted to the introduction of automated systems for the control of construction and technological processes. Most of the internal capital investments of the USSR

Ministry of the Construction Industry for production purposes will be directed to the realization of measures related to solution of these problems, ensuring an increase in the technical level of construction.

Plans call for a substantial increase in use of existing enterprises in the construction industry, ensuring an increase in the capacity for the production of reinforced concrete, joiner's items, and also inert materials, including light fillers. Most of the increase in volume of production of prefabricated reinforced concrete construction components must be obtained by the reconstruction and technical re-outfitting of already existing enterprises.

An increase in the productive capacity of construction industry enterprises will be accompanied by the removal of outdated construction components and mastery of production of new progressive series. For example, plans call for the substantial renovation of construction components for industrial construction, completion of the changeover of enterprises for large-panel and "three-dimensional - unit" house construction to the output of new series with a subsequent increase in the volume of production of such elements.

The program provides for an increase in the production of efficient construction components: industrial partitions, composite roofing slabs, corrugated roofing components, wall panels with effective weatherproofing and unrolled roofing materials, thin prestressed plates and slabs with a span of 18-24 m.

The increase in production volume and increase in the degree of factory finishing of construction components and parts at construction industry enterprises is to be achieved for the most part by an increase in the productivity of labor. At these enterprises provision is made for the introduction of a large number of automated and highly productive mechanized production lines. Measures in this direction have been made specific in the objective programs "Progress," "Industrial Construction" and "Quality Control," "Economy and Efficient Use of Material Resources." They should ensure an increase in the level of prefabrication in industrial construction and in the construction of housing and projects for increasing the standard of living and almost all the economy of the material and fuel-energy resources foreseen for the ministry as a whole.

There is a need for energy and persistence, initiative and exactingness on the part of workers, engineers and directors of construction industry enterprises in the implementation of the developed programs, introduction of the attainments of scientific and technical progress into production and unconditional assurance of implementation of the new strenuous plans.

The third direction combines measures for improving the system for the control of construction and improvement in economical work.

The measures in this direction are meant to ensure a considerable increase in the volumes of contracting work and an increase in the average work load of general construction trusts and construction administrations. Plans call for the implementation of the general scheme for the control of construction, approved in the established order, consolidation of construction organizations and assurance of the entire increase in the volume of work without an increase in the number of organizations existing in the ministry, development

and introduction of standard staffs at all construction organizations, truck transportation enterprises and auxiliary production organizations and administrations of production combines.

In the realization of the objective program "Control and Economy" the ministry gives great importance to work on restriction on the number of projects simultaneously under construction with a substantial increase in the volume of contracting work per one construction project. At the same time, provision is made for improvement in the existing system for the planning of construction on the basis of formulation and introduction of the first level of the Unified System for the Planning of Capital Construction (YeSPKS) with use of electronic computers and on this basis assurance of a balance of plans, an improvement in long-range, current and operational planning.

The objective program provides for a strengthening of the principles for economic computations, implementation of research and use of still-existing possibilities for reducing the cost of the work done and completed products, improvement in contract estimation work and upgrading of bookkeeping and financial work.

The economists, planners, estimators, norm-setters, bookkeepers, financiers, engineers and specialists at computation centers of the corresponding subdivisions of design-technological institutes and trusts of Orgtekhnstroy must today perform such work and have such an attitude toward their responsibilities as will ensure high economic indices in the activity of each enterprise and organization and the ministry as a whole.

The fourth direction in the comprehensive program brings together a system of measures of a social nature whose realization is directed to the organization of stable work groups, an increase in the skills of workers, the development of creative initiative of workers at construction organizations and universal strengthening of work discipline.

The objective program includes the goal of ensuring a stabilization of the number of workers in construction-erection and in auxiliary production work and overcoming the tendency of turnover in personnel. Without question the solution of such a problem will require considerable expenditures on construction of housing, kindergartens and preschools, recreational and resort facilities, dispensaries, pioneer camps and technical schools.

Measures in this direction are outlined in the objective program "Personnel" and provide for a reduction in the turnover of work personnel and engineering and technical personnel, an upgrading of the ratings of workers, a number of other measures ensuring an increase in the skills of workers, holding of inter-construction project schools for the training of engineering and technical workers, brigadiers and laborers, development of creative initiative of work groups in solving problems related to production-economic activity of organizations, activation of the work of permanently standing production conferences and councils of brigadiers and young specialists.

The broad explanation of the goals and objectives of this objective program and measures for its realization is the duty and a matter of honor for workers of personnel services and a field of activity for the social organizations of work groups.

The fifth direction, outlined in the objective program "Science," includes the carrying out of basic research, scientific research, experimental design and planning-technological work directed to an acceleration of solution of the most important problems required for a substantial increase in the efficiency of construction work.

This objective program provides for a group of measures for speeding up the introduction of the attainments of scientific and technical progress in practical construction work and increasing the effectiveness of scientific research work on fundamental problems ensuring a considerable increase in the productivity of labor.

The program provides for carrying out work in two principal sections: basic research work, ensuring long-range development of scientific potential, and work directed to the scientific and technical support of objective and local programs for current activity. In these directions it is proposed that broad basic scientific research be organized with involvement of the scientific institutes of USSR Gosstroy, State Committee for Science and Technology and other departments.

With respect to shortening the duration of construction the program provides for investigation in the field of improvement in planning, ensuring balance in the plan, a reduction in the number of projects simultaneously under construction, the concentration of work and material-technical resources at projects being started up, taking into account their priority and the requirements of comprehensive engineering preparation for construction work.

In order to ensure the increase in the productivity of labor, the program provides for research on construction work using new industrial construction systems based on the maximum industrialization of construction, use of construction components and items with a high degree of factory finishing, their fully coordinated delivery as large blocks, and also development of construction methods ensuring speedy erection of buildings and structures.

The development of broadly mechanized technologies and systems of machines and mechanisms of promising models ensuring a gradual changeover to the automation and robotization of production processes is directed to a decrease in the percentage of manual labor in construction.

Work on the practical introduction of construction of resource-saving and breakdown-free technologies, the use of secondary resources and industrial wastes is intended for favoring assurance of economy in use of material resources in construction.

The objective programs include a number of types of scientific research and experimental design work ensuring an increase in the organizational-technical level of construction. Measures along these lines are set forth in ten local

work programs: "Gypsum," "Cement-Chip Slabs," "Plastic Pipes," "Progressive Pile Foundations," "Use of Secondary Raw Material," "Automated Control System and TP ACS," "Thin Prestressed Reinforced Concrete Plates," etc.

It must be acknowledged that scientific workers have a duty to the branch. Ensuring advanced development of scientific research in the field of construction, introduction of the advances in scientific and technical progress into production and on this basis, bringing about a shifting of the branch onto the rails of intensification; this is the patriotic and professional duty of scientists, all workers at scientific research, planning and design-technological institutes and Orgtekstroy trusts.

An important place in work under the objective programs is allocated to the system for the monitoring and control of the course of their realization with electronic computers. The fundamental features of this system have been clearly defined and this will exert a positive influence on the implementation of the programs.

Without question the results of work of builders will be influenced by a whole series of problems whose solution is beyond the limits of competence of the USSR Ministry of Industrial Construction. The ministry has secured the support of the USSR Gosplan, the State Committee for Science and Technology and other departments and there is assurance that serious problems will be solved in the shortest possible time.

In summarizing everything set forth above, it must be emphasized once again how complex and large-scale are the tasks which the ministry must deal with. The objective programs themselves, however good they may be, will not solve these problems. There must be everyday purposefulness of work on persistent realization of the planned measures by workers of the central administration of the ministry and the directors of construction organizations in the field.

It must be emphasized that work on increasing intensification of construction work is a serious check on the political, business and professional qualities primarily of directors at all levels and a check on the ability to conduct business with present-day requirements taken into account.

The direction of the efforts of work groups, the experience of engineering-technical workers, technicians, employees, personnel workers, rationalizers and inventors on attainment of the main goal -- a universal and stable increase in the productivity of labor in all aspects of construction work -- must be regarded as the goal which is first and foremost in importance.

The realization of the comprehensive program of the USSR Ministry of Industrial Construction "Intensification of Construction Work-90" will be the response of all work groups in the ministry system to the resolutions of the April (1985) Plenary Session of the Central Committee CPSU on acceleration of economic development of the national economy, a contribution to a worthy welcome to the 27th Congress CPSU.

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## CONSTRUCTION PLANNING AND ECONOMICS

### ATOMMASH CHIEF ENGINEER DISCUSSES CONSTRUCTION QUALITY CONTROL

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 3 Nov 85 p 2

[Article by A. Zhmakin, chief engineer of the Capital Construction Administration of the Atommash PO [Production Association]: "Quality Control on the Construction Job"]

[Text] Two months ago we accepted this nine-story apartment building from the construction workers with a grade of satisfactory. But very recently, at the request of the party committee, I had to look into a complaint: the new occupants had uncovered a lot of defects, both obvious and concealed, and had given their own grade of unsatisfactory. This is not a rare happening. Standard apartment houses have standard apartments, and, one must say, standard defects as well.

An average of 150,000-200,000 square meters of living space and several dozen multi-unit apartment houses are put into service annually in Volgodonsk. In this five-year plan not one of them has been outstanding. More than half were accepted with a grade of satisfactory.

It really makes you think. Construction workers are monitored daily in the course of operations by qualified foremen and supervisors. Right after them come the technical inspection and the contractor's construction laboratory. The author's inspection is alert to see that everything is performed to plans, and the customer's technical inspection monitors things on his behalf. And apart from them, every project is provided with an inspector from Gosarkhstroykontrol [State Architectural and Construction Control]. Inspector after inspector in three layers, and still the new occupant gives it a sorry grade. This means not just that the construction workers are doing poor work, but that the entire multi-level monitoring system is malfunctioning.

At first glance it would all seem clear: just do it the way the blueprints show, and the way it is laid out in GOST [the All-Union State Standard] and in construction norms and rules, and all the problems will go away by themselves. In order to have an effective impact on work quality during its performance and not after it is completed, and in order to oversee the observance of production-process discipline on a construction job there is a sizable engineering-technical staff -- from foreman to chief engineer -- equipped with such a complex and

multipurpose tool as KSUKS, the integrated system for managing construction quality.

But, judging from the results of the Volgodonsk Building Construction Combine and of Grazhdanstroy [not further identified], this tool is not effectively linked to economic levers. To put it plainly, it has too little effect on the wages of poor workers, including those who let defects get by during inspection.

The estimate for every job calculates down to the last nail, including the wage fund, how much it will cost to construct the building. To be sure, it does not stipulate that this is pay for excellent work (per plans and GOST). What happens is strange. In a shop second-class merchandise is sold more cheaply than first-class. But construction workers present the customer, and in the final analysis the new occupant, with a third-class building, and for this they get full pay. Moreover, if they keep on schedule, they are due a bonus for this "satisfactory", for completing the job. With these favorable terms, is there any incentive to strive for quality?

Apart from this first (and, in my opinion, main) stage of construction monitoring, there is a second one -- the contractor's technical inspection, that sees to it that they have seen to it. The technical inspection personnel are higher in rank, but their position is highly ambiguous. On the one hand, they are "interfering" with the construction workers, rejecting work and forcing things to be done over, but on the other, they are administratively subordinate to the same construction administration or trust, and this substantially moderates, if it does not reduce to zero, their strictness and adherence to principles.

When the primary monitoring is unreliable, you can't do without inspection on the part of the customer. The man from technical inspection is also a monitor who sees to it that all the work has been performed just as it should be, and it is no small matter that he is paid by the customer. His signature on documents certifies the performance of work that cannot be seen, and authorizes payment for things that had not been taken into account. In short, he must act as if there had been no monitoring at all prior to himself.

It is no accident that for every project, along with the other documents, Stroybank [All-Union Bank for the Financing of Capital Investments] also requires certification from a representative of technical inspection, and sternly warns him that if he accepts work that was poorly done and that deviates from plans, he assumes responsibility for the faulty construction, and will be dismissed from his job, and even held criminally liable.

With these requirements and this responsibility the job of inspector should be held by a construction ace with advanced engineering education and experience. But where to find one? It is certainly not a secret that the pay of an engineer of technical inspection is considerably lower than that of the ones he is monitoring, and the work load is such that an inspector gets to each of his assigned facilities once a week at best.

But the main thing is that all the careful checking and sticking to principle of the customer's inspector is likewise awkward: If he halts the work, makes no

allowance in the performance for construction defects, and demands that work be done over, this means that the plan for investment and startup will likewise not be fulfilled -- the customer's own plan! Theoretically, the customer and contractor should be making strict demands of each other. But in fact they are linked together by a single economic bond.

The author's inspection also sees to the same thing, adherence to plans, norms and rules, and in effect duplicates the two preceding checks. But since it has no links to anyone else, it should be like a rock. That may be so, but the author's inspection can't do much by itself; it has no right to bring poor workers to account or to impose material penalties. It can only make an official complaint to the customer or to State Architectural and Construction Control.

Moreover, the time of the author's inspection is taken up by much coordinating and recoordinating of design discrepancies and in eliminating its own defects. Is author's inspection really needed in the age of large-scale standardized building? Furthermore, problems in coordination arise because they approach design documentation in the old way. The conversion to price lists and standardized estimates has wholly freed us from this pointless work.

In matters involving truly major government interests we have full authority to refer them to responsible and competent organizations -- Gosatomnadzor [not further identified] and to State Public Health and State Vehicle Inspection. Quality control is also a government matter no less important than traffic safety. And in my opinion the monitoring of it should be put in one set of truly government-level hands that are free from any departmental interest.

An authority of this kind, which is vested with the required rights and powers, already exists -- State Architectural and Construction Control. But since it is understaffed, it has little power. I think that tightening up ruble responsibility at the first stage (for third-class work, pay correspondingly) the intervening stages could be done away with. And with the forces and means thus freed we could enlarge the personnel of State Architectural and Construction Control and increase the pay of inspectors, which would attract more experienced and competent specialists. The outcome is unquestionable: we would not only obtain a more effective tool for quality control, but also considerable savings in the wage fund.

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CSO:1821/62

CONSTRUCTION PLANNING AND ECONOMICS

SYNOPSIS OF ARTICLES IN MEKHANIZATSIYA STROITELSTVA, SEP 85

Moscow MEKHANIZATSIYA STROITELSTVA in Russian No 9, Sep 85 p 32

UDC 69.002.51-82:658.58

IMPROVING EFFICIENCY OF SERVICING, REPAIRING MACHINERY WITH HYDRAULIC DRIVE

[Synopsis of article by O. A. Bardyshev, I. A. Matveyev, G. I. Konstantinov, et. al, p 5]

[Text] The article describes the experience of administrations and trusts for the mechanization of construction organizations in improving the efficiency of servicing and repairing machinery with hydraulic drives in the scope of implementing the Intensification-90 integrated territorial target program. It demonstrates the organization of the quality control and purification of the working fluid of hydraulic systems and of filling and replacing it, and the experience of diagnosing, repairing and testing hydraulic units in the shops of mechanization administrations. Seven illustrations.

UDC 693.546

PNEUMATIC TRANSPORT OF CONCRETE MIXES

[Synopsis of article by A. T. Lorman, p 10]

[Text] The article demonstrates the advantages of the intra-facility transport of construction mixes through pipelines, specific features of pneumatic transport in batch mode, and the possibility of improving the operating reliability of pneumatic facilities operating in batch mode by using a new method for transporting dry and loose concrete mixes with porous aggregates and loose mixes with dense aggregates. Describes the structure of a special valve nozzle and shows the computation for determining the counterweight of the nozzle, in accordance with the diameter of the pipeline, its length and position and the number of bends in the pipeline. Results are shown of experimental tests of the new methods at one of the facilities of Dnepropetrovsk, as well as the effectiveness of using it in construction. Two illustrations.

UDC 69.055.004.3

## ADVANCED TECHNOLOGICAL PROCESSES OF DELIVERING FREIGHT

[Synopsis of article by M. I. Griff, M. P. Ryauzov, V. F. Trofimenikov, p 12]

[Text] The article presents a new approach to improving the operation of specialized transport in construction. Effectively linked to the technology of construction, trailer trucks have unloading facilities that preclude downtime in transportation and the involvement of installation cranes for unloading. The new technology for delivering construction freight by using self-unloading vehicles includes components for dwellings, containers, stock buildings, pipe with perlite casing and assemblies weighing up to 40 tons.

UDC 693.612

## FOR MECHANIZED PLASTERING OPERATIONS

[Synopsis of article by A. G. Onishchenko, R. I. Revenko, G. I. Strilets, N. V. Kiselev, p. 14]

[Text] The article presents the results of experiments in adding plasticizing ingredients to liquid plaster delivered to a construction site in order to improve its initial characteristics. Simplex-planning was done to determine the optimum quantity of additive, which made it possible to perform the work directly at the construction site. Use of a compound additive made it possible to reduce lime consumption, while maintaining the prescribed strength of the hardened plaster, eliminate unproductive waste of construction material, reduce the quantity of ballast moisture occurring in a building under construction, and increase the labor productivity of the plasterers. Three tables, bibliography with four citations.

UDC 622.232.8:622.26.52

## LASER SYSTEM FOR AUTOMATICALLY MONITORING POSITION OF HEADING MACHINES WHEN BUILDING COLLECTOR TUNNELS

[Article by N. A. Glebov, A. N. Vershinin, R. G. Sivashinskiy, V. B. Shirayev, p 16]

[Text] Describes laser system of automatic monitoring that makes it possible to automatically determine the deviation of the cutting end of the long axis of the machine in plan and profile, and the magnitude of the angle of pitch. Results are shown of industrial tests of the monitoring system, which have made it possible to determine the reliable operating capabilities of the device, and its ability to monitor the direction of the heading machine's movement to the desired accuracy. Two sketches.

UDC 693.28

## SUPERBLOCK OF PIER STRUCTURE

[Article by V. V. Goncharov, B. I. Polyakov, p 18]

[Text] Reviews problems of using the module-block method of building piers in remote undeveloped areas of Western Siberia. Describes the structure of a floating superblock of a pier structure fabricated at a rear support base and delivered by water to the installation site as part of a string that includes floating standard components for housing and equipment. One illustration.

UDC 629.002.5:004.67

## REDUCING DOWNTIME OF MACHINERY UNDERGOING REPAIR

[Article by D. I. Taran, M. M. Yakuntsev, p 19]

[Text] The article presents figures on above-normal downtime of construction machinery undergoing repair or awaiting repair in the period 1976-1982. The main reasons for this downtime are shown, as well as measures needed to reduce it.

UDC 621.879:624.134.004.68

## MODERNIZING OPERATING ELEMENT OF ETTs-208A TRENCH DIGGER

[Article by V. P. Bondarenko, G. K. Galitskiy, p 21]

[Text] The article presents the results of work to modernize the operating element of the ETTs-208A excavator in order to improve its productivity and operating capability when digging trenches in tough permafrost soils, including those that have gravel and pebble inclusions. Two illustrations, bibliography with two citations.

UDC 624.138

## DETERMINING COMPACTING CAPABILITY AND PRODUCTIVITY OF SOIL-COMPACTING EQUIPMENT

[Article by L. M. Bobylev, N. V. Barinov, T. Ye. Vlasova, A. K. Shabardin, p 23]

[Text] The methods of testing soil-compacting equipment described in the article consist of two parts: determining rational methods of compacting and determining equipment productivity. Experiments to determine rational methods of operating the machinery were done in three stages. The first determined the optimum time for compacting soil (number of blows); the second, the density or compacting coefficient of the soil; and the third, rational methods of compacting. Determination of equipment productivity was done for various degrees of

thickness of the compacted layer and for various degrees of compactness. Two illustrations.

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## INDUSTRIAL CONSTRUCTION

NOVOLIPETSK METALLURGY COMBINE PROFILED

Moscow STROITELNAYA GAZETA in Russian 21 Jul 85 p 2

[Article by STROITELNAYA GAZETA special correspondent I. Baranovskiy:  
"Novolipetsk Steel"]

[Text] With each passing year the productive capacity of the Novolipetsk Metallurgical Combine is increasing. It is now one of the largest in the country. Builders have erected unique high-capacity blast furnaces and workshops here. Work on them has still not been finished -- the combine is expanding and is being reconstructed. Accordingly, the Day of the Metallurgist is being celebrated today by steel workers and construction men, who have been working together like hand and glove and who have become an outstanding example of work cooperation.

Here is what our correspondent was told by V. Gusev, deputy head of the Main Administration of Construction in Lipetsk, Ministry of Construction of Heavy Industry Enterprises:

It was specifically the vigorous development of ferrous metallurgy in the region, especially the very rapid rates of growth of the Novolipetsk Metallurgical Combine, which was the reason for the establishment of our main administration in 1970. From the very first days it was necessary to undertake complex and highly responsible tasks: erection of an oxygen-converter shop, blast furnaces, sintering plant and coking facilities. The combine by that time had become a sort of test area for the branch, where all new technical solutions were checked out. We also introduced innovations, together with the metallurgists.

And it must be said that this stood us in good stead. Striving to make maximum use of reserves, all projects were completed strictly on time, and many of them considerably ahead of time. For example, the oxygen-converter shop No 2 was put into operation a half-year earlier than planned and blast furnace No 6 was constructed in a record short time -- in just 21 months!

During the present five-year plan we are carrying out reconstruction of vitally important parts of the combine. It can be said that this work required a jeweler's accuracy from us, special skill, since from time to time it is necessary to work under conditions of on-going production. A major event was the 1983 delivery of the first two sections of the shops for the cold rolling

of carbon steel. I note that its introduction into operation was accomplished rhythmically, without interruptions.

During the four years of the five-year plan we put into operation all the intended objects, met all technical and economic indices and during this period increased the productivity of labor by 16%. During the first half-year of 1985 the general performance plan was implemented 108% -- 103% through the efforts of our own personnel.

Now we have a new object on the boards -- the shop for the cold rolling of dynamo steel. The emphasis has been concentrated on this project. The normal time for construction of the shop is 3.5 years. The work here will be finished considerably ahead of time, a year in advance. Such a goal was set in the socialist obligations which the construction men adopted for 1985-1986.

The most careful engineering preparation ensured a successful start. Great merits in this respect belong to the long-range planning group of the Orgtekhnstroy Trust which develops optimum planning-design solutions on the basis of the most advanced technologies and methods for work organization. Cooperating closely with Giprozem (our leading planning organization), the group members made substantial corrections to the layout plans for the dynamo steel shop. As a result, the economies amounted to about 5 million rubles and the work expenditures were reduced by approximately 100,000 man-days.

In order to ensure high rates of construction work, we are striving to make maximum use of the achievements of scientific and technical progress. Use is being made of efficient shapes of rolled metal for metal structures: wide-strip I-beams, curved and curved-welded shapes and steel with enhanced and high strength. All structural junctions in the frame for the dynamo steel shop are coupled with high-strength bolts. Extensive use is made of the conveyor belt method for installation of the roof, making it possible to increase work productivity by 30-40%.

Among the innovations which were introduced we can also mention progressive methods for preparation of cement molds, stand installation of bridge cranes, monolithic reinforced concrete foundations and "closed section" units in water line and cable conduits.

The "unit method" is also being used successfully. The industrial complex under construction was broken down into 33 units. A total of 75% of all the work is being done on the basis of brigade organization. The construction organizations of the administration are striving to organize enlarged brigades with a work assignment of not less than 1 million rubles. For example, the brigade of Hero of Socialist Labor I. Makarov assumed a contract of 1.5 million rubles for the construction of underwater oil storage facilities in the dynamo steel plant and successfully dealt with the task which they had assumed. There was also good performance by the brigade of M. Didenko, RSFSR Meritorious Worker, which took on a contract for 1 million rubles for construction of a foundation under the pickling apparatus and which has already completed the work.

It should be noted that good living conditions have been provided for the construction crews. For example, a dining hall with 440 seats has been constructed; there is a network of temporary snack facilities at the construction sites; an ample dormitory has been provided.

The work pace which has been assumed inspires assurance that the industrial complex will be put into operation in time, in the first half of 1986, as was provided for in the socialist obligations.

5303  
CSO: 8144/0005

HOUSING CONSTRUCTION

REVIVAL OF 5-STORY URBAN APARTMENT BUILDINGS NOTED

Moscow MOSKOVSKAYA PRAVDA in Russian 9 Aug 85 p 2

[Article by G. Timokhov, candidate of architecture, head, Interior and Architectural Light Engineering Laboratory, MNIITEP [Moscow Scientific Research Institute of Standard and Experimental Planning]: "The Rehabilitation of Five-Story Buildings"]

[Text] We are rightly proud of the great achievements in new residential construction in Moscow: literally before our eyes, hundreds of multistory dwellings with expressive architecture are springing up. They have well laid out apartments of various types, roomier auxiliary areas and modern engineering equipment.

Against the background of these achievements, the five-story dwellings built in the 1960's look antiquated. This, plus the lack of land in the city for further construction, engendered the opinion in circles of specialists (even in the press) that it is advisable to raze these buildings and construct new and taller ones in their place. At first glance the reasonableness of razing the five-story dwellings under these conditions is correct; however, this involves not one or two buildings, but a vast amount of the city's living space (a total area of more than 20 million square meters) in which more than a million people live and that still has a calculated service life of more than 70 years. Moreover, it should not be forgotten that the premature razing of these dwellings will require huge forces and means and much time. It has been calculated that in order to reconstruct this amount of area through new dwellings, Glavmosstroy [Main Administration for Housing and Civil Engineering Construction in Moscow City] will require at least 7 years, providing that it is freed of other work. Besides that, the additional area (about 25 percent) that can be obtained through the construction of multistory dwellings in places where five-story ones have been razed will make it possible to improve living conditions only for those now living in them, by basically giving them separate apartments. Consequently, the date for obtaining separate apartments for those who still live in communal ones will be delayed.

All these problems forced us to examine objectively the features of five-story dwellings. In the pages of MOSKOVSKAYA PRAVDA there has already been a discussion of the work done by the Moscow Scientific Research and Planning Institute of Standard and Experimental Planning, done jointly with the Moscow Architectural Institute and MoszhilNIIproekt [expansion unknown], as a result

of which it was discovered that there is a fundamental possibility of modernizing the five-story dwellings and reorganizing them into apartments with a small amount of floor space, but with due consideration for the requirements of modern comfort. However, more extensive and comprehensive investigations were required before final conclusions could be reached.

On the instructions of GlavAPU [Main Architectural Planning Administration of the City of Moscow], in 1984 MNIITEP carried out a scientific investigation that made it possible to generalize the experience amassed in operating five-story dwellings. Many of the institute's scientific laboratories participated in this work. Architectural light engineering and interior problems were studied, along with the typology of and prospective problems with the living quarters, experience in industrial construction was correlated, and research was done into the strength of designs, the working properties and protection against corrosion of structural materials, structural acoustics, engineering equipment, technical and economic substantiation and so on. The city-building questions were investigated by Workshop No 1 of Mosstroyek-2 [Institute for the Planning of Housing and Civil Engineering Construction in the City of Moscow]. Use was also made of the great experience and statistical data of NIIPIGenplan Moskvy [expansion unknown], MoszhilNIIproyekt, MArkhI [probably Moscow Architectural Institute], MISI imeni V.V. Kuybyshev [Moscow Construction Engineering Institute imeni V.V. Kuybyshev] and the Academy of Municipal Services imeni Pamfilov.

#### To what results did this integrated investigation lead?

Let us discuss several aspects, such as the sociological one. Queries were made of residents of 16 dwellings of various series in different administrative rayons in Moscow (Gagarinskiy, Brezhnevskiy, Volgogradskiy, Kuntsevskiy and others). It was first necessary to discover the basic shortcomings or positive qualities that, in the opinion of the residents, are inherent in their apartments or living quarters. It was ascertained that practically all the residents of the investigated dwellings would like to retain their place of residence. The basic arguments in favor of five-story buildings are that the dwelling is relatively close to the central part of the city and that people are provided with transportation, cultural, domestic, medical and other services. Of no little importance in connection with this are the habitual interrelationships, built up over many years, with the work place, school, leisure activities and neighbors; the residents would like to retain them. The residents have a different attitude toward apartment layout. It depends on the number of members in the family and its composition, as well as apartment size. However, the typical unsatisfactoriness is with inadequate area of the auxiliary premises and the lack of elevators and trash chutes. Nevertheless, 34-77 percent of the families that were queried (the percent depends on the series of the dwelling, its physical state and the apartment population density) wish to remain in the apartment they now occupy after capital repair is done on it. They are basically individuals or families of two or three people living, respectively, in one-, two- and three-room apartments. Elderly parents of compound families wish to remain in their former apartments providing that the young family (or members of the family) move to a new apartment (in this case it is desirable that it be in a neighboring dwelling or even in the same rayon).

It is important to emphasize that a large percentage of the families wishing to remain in their own apartment express desires about its remodeling (isolation of communicating rooms, enlargement of the kitchen or entrance hall through a reduction in the living area, the installation of built-in cupboards). That is, they want the apartment layout to be brought into accordance with that of the newly built dwellings. Up to 11 percent of these families are ready to carry out this remodeling with the investment of their personal means if the expenses are not too great and the services are well organized. By the way, some tenants have already done this "spontaneous" remodeling.

According to data from a selective investigation of several rayons, the average living area for the populace is about 10 square meters per person. Almost 95 percent of the apartments are occupied by families. However, it is necessary to take into consideration the fact that despite the practically identical living area standard per person in a five-story dwelling and in a new one, in the latter the comfort of living is higher because of the greater percentage of auxiliary area.

Another aspect of the investigation was the technical one. In most dwellings the technical state of the above-ground load-bearing designs can be evaluated as satisfactory. The same thing can be said about the dwellings' functional qualities. There are various defects, but they can be eliminated in the course of capital repair. Practice confirms this. Where this repair has been carried out informally the rayons look more comfortable and the dwellings neater, and the residents complain less about the functional qualities and the shortcomings of the apartments' layouts.

The masses of five-story construction are of great city-building value. As a rule they are relatively close to the central part of the city and are provided with transportation, commercial, entertainment and medical institutions, as well as a developed green belt and leisure zone system. And high buildings, which are advisable to place in the center of an area of new construction or next to it, can give a metropolitan and more contemporary form to the five-story blocks of dwellings.

Thus, a conclusion can be drawn: it is advisable to modernize the five-story structures for the purpose of improving the living medium (the construction of missing service facilities) and improving as a whole the architectural and city-building qualities.

In connection with this, we should first modernize those rayons that are provided to the highest degree with transportation, commercial and children's preschool establishments, schools and cultural and domestic services. Among them are Volkhonka-ZIL, Khoroshevo-Mnevniki, Sviblovo and others. In these rayons there is a possibility of increasing the living area by adding three or four stories to some five-story dwellings and building dwellings that are inserted between existing dwellings, as well as building dwellings with more floors and population service buildings. As a result of this integrated modernization, it may be possible to obtain renovated and completed ensembles that meet contemporary city building and architectural requirements.

As a result of the first stage of this integrated investigation, MNIITEP is developing recommendations for various methods for renovating dwellings. In Mosproyekt-2's Workshop No 1, experimental plans for the modernization of blocks are being created in conjunction with NIIPIGenplan Moskvy. They will take into consideration MNIITEP's recommendations for the modernization of dwellings depending on their structural systems.

In a word, we have created the theoretical basis for carrying out experiments for the modernization of five-story dwellings with the subsequent integrated modernization of blocks, as a result of which the construction done in Moscow in the 1960's can be brought into line with contemporary and future city-building requirements. The solution of the five-story dwelling problem cannot be delayed.

11746  
CSO: 1821/165

CONSTRUCTION MACHINERY AND EQUIPMENT

UDC 666.940.41:66. 043.1

SERVICE LIFE OF LININGS IN CEMENT PRODUCTION SYSTEMS DISCUSSED

Leningrad TSEMENT in Russian No 1, Jan 85 pp 12-14

Article by L.I. Skoblo, Candidate of Technical Sciences and S.S. Grigoryan and B.L. Kazanovich, engineers: "Service Life of Cement Furnace Linings in 1983"/

Text In 1983, on the average for all cement plants, the duration of the inter-lining operating period amounted to 229 days -- the same as in 1982. This was 20 days less than the maximum value for this indicator, reached in 1976-1977. At the same time, a considerable number of examples of high lining durability can be found throughout the branch. In 1983, an average operating period duration of more than 350 days was noted at 16 enterprises, including the Angarsk Cement-Mining Combine, the PO Akmyantsementas and the PO Glinozem Cement Plant. However, the operating period for linings at nine plants amounted to an average of less than 100 days, with this situation being observed at enterprises equipped with new and powerful furnaces -- at the Razdan, Navoi, Ust-Kamenogorsk and Checheno-Ingush plants, at a cement plant of the Achinsk Alumina Combine and at the PO Karagandatsement.

It is a well known fact that the average service life of a lining decreases with an increase in the diameter of the furnaces. Table 1 provides a comparison of the results of the inter-lining operating periods for 1983 and 1982 against their maximum, achieved over the past 15 years. Compared to the first half of this period when a clear increase was observed in furnaces measuring 4.0 and 4.5 meters in diameter (operating period increased by 2 months), at the present time an increase is being noted only in the group of furnaces measuring 3.6 meters in diameter, in which a maximum was achieved this year. In the case of the remaining sizes, the annual fluctuations in this indicator were rather great, but no regular change is being noted here.

The operation of the group of furnaces measuring 5 meters in diameter is deserving of special attention. Progress here in the durability of furnace linings has been lacking for all practical purposes for a period of 15 years: in 1969, it amounted to 144 days. However, opportunities are available for improving the operation of these furnaces, as borne out by the experience of individual enterprises, for example the PO Akmyantsementas, where the operating period for Furnace No. 7 amounted to 405 days, and also by individual departments.

TABLE 1

Назначение показателей (1)	Продолжительность междуфурножной линейки (сут) по печам диаметром (м) (2)				
	Более 5 м (3)	3.0	4.5	6.0	8.0
Межфурножные линейки: (4)					
1960 г.	97	152	260	233	279
1962 г.	95	154	262	257	289
Наибольшая стойкость футеровки за период 1960— 1963 гг. (год достижения максимума)	144 (1970)	164 (1960)	210 (1974)	287 (1977)	279 (1964)
Количество кирзов, проработавших в 1983 г., от их общего числа, % (5)	2.8	26.3	8.0	39.9	28.6

Key:

1. Indicators	5. Greatest durability of lining during
2. Duration of inter-lining operating	1969-1983 period (year in which
period (days) for furnaces the	maximum was achieved)
diameter of which is:	6. Number of operating periods carried
3. More than 5 meters	out in 1983, compared to their overall
4. Inter-lining operating period:	number, in %

The results from the operation of large furnaces in the western and eastern regions of the RSFSR and in the Ukraine are presented in Table 2.

TABLE 2.

Организации (1)	(2)	(3)	Результаты кирцевых по печам диаметром 5 м и более (4)			
			(5)	(6)	(7)	(8)
Главзападтсмент (9)	224	48.0	125	2.91	49	64
Главвостоктсмент (10) (11)	222	54.3	128	2.39	81	66
Объединение «Укртсмент»	218	42.4	124	2.82	44	50

Key:

1. Organization	5. Duration, in days
2. Average operating period for	6. Idle time, in hours per day
plants, in days	7. Number of operating periods
3. Proportion of operating periods	8. Standard deviation in duration,
completed as a result of wearing out	in days
of lining, in %	9. Glavzapadtsement
4. Results of operating periods for	10. Glavvostoktsement
furnaces measuring 5 meters or more	11. Ukrtsment Association
in diameter	

The duration of the operating periods achieved by enterprises of Glavvostoktsement was considerably higher than in Minstroymaterialy [Ministry of the Construction Materials Industry] of Armenia and higher than that for such large subunits as Glavzapadtsement and Ukrtsment, although a large group of powerful

furnaces is being operated in the east. The data in the tables indicates that this was achieved as a result of better operation of the furnace equipment -- here there was less idle time and the proportion of the operating periods which ended as a result of natural wear and tear and planned repairs was great.

The data furnished in Table 2 testifies to the fact that Glavvostoktsement is operating its powerful furnaces most successfully as a result of carrying out efficient repairs on this equipment.

At the present time, the principal causes for operating periods coming to an end, both throughout the branch as a whole and also for furnaces 5 meters in diameter have been mechanical problems (35 and 36.4 percent respectively) and planned repairs (30 and 32 percent respectively). But if in the case of smaller diameter furnaces the difference between the average service life of a lining that was interrupted as a result of planned repairs is not very great, but nevertheless greater than operational periods which ended as a result of natural wear and tear, then for furnaces measuring 5 meters in diameter this indicator reaches a maximum of 77 days (duration of 143 and 220 days respectively). Substantial improvements are required in the planning of repair work for furnaces of this group.

The duration of the operating period for a group of furnaces for the dry method of production, having a diameter of 6.4 meters in the caking zone, amounted to only 79 days. The lowest service life for a lining (43 days) occurred in the case of Furnace No. 5 at the PO Karagandatsement and the highest (103 days) -- Furnace No. 8 at the Novospasskiy plant. Over a considerable period of time, the operating period for linings on large dry method furnaces rarely exceeded 120 days. However, the experience accumulated at the Lipetsk Cement Plant has revealed that extended operating periods and a reduction in the consumption of magnesian refractory material are fully possible in the case of dry method furnaces.

During 10 years of operation of a furnace measuring 5 X 75 meters at the Lipetsk plant, the highest duration of an operating period (120 days) occurred in 1980. In 1983, the service life for a lining of this furnace unit increased sharply and amounted to 319 days, with a specific consumption of refractory material in the caking zone of 0.61 kilograms of clinker per ton. In the process, the technology for the roasting of clinker, by means of a separate delivery of raw material components, ensured a threefold increase in the stability of a lining and a reduction in the specific consumption of fuel.

A vital task with respect to furnaces used for the dry method of production is that of eliminating violations of the roasting regime. Operating periods which were interrupted for this reason turned out to be very low in terms of lining durability. Optimization of the thermal engineering regime must be carried out when the equipment is being operated in a stable manner and priority attention must be given to improving the operation of the furnaces of the Novokaraganda and Navoi plants.

The effects of various types of fuel on the service life of linings and on other parameters are compared in Table 3.

TABLE 3

Наименование показателя (1)	Использование на печах агрегатах (2) в качестве топлива			
	уголь (3)	газ (4)	мазут (5)	попеременно газа и мазута (6)
Длительность кампаний, сут (1983 г.) <sup>(7)</sup>	128	176	189	181
Удельный расход огнеупоров, кг/т <sup>(8)</sup>	2,07	1,90	1,38	1,96
Количество горячих ремонтов <sup>(9)</sup>	2,2	2,6	2,0	4,5
Простой за кампанию, % <sup>(10)</sup>	393	419	379	420
Простой за сутки, % <sup>(11)</sup>	3,1	2,4	2,0	2,3
Ритмичность, сутки остановки <sup>(12)</sup>	3,7	5,2	5,1	4,4
Длина футеруемого участка, в калибрах <sup>(13)</sup>	7,5	10,5	11,1	10,3
Положение конца прогара, в калибрах <sup>(14)</sup>	5,4	6,7	6,4	7,0
Доля кампаний, заканчивавшихся в результате износа футеровки, % <sup>(15)</sup>	40,6	48,7	58,9	46,7
Время на ремонт 1 погонного метра футеровки, ч <sup>(16)</sup>	3,8	2,7	2,9	2,6

## Key:

1. Indicator	11. Idle time during 24 hours, in hours
2. Use as fuel in furnace units	12. Rhythm, in days per stoppage
3. Coal	13. Length of lining section, in calibers
4. Gas	14. Status of end of burnout, in calibers
5. Mazut	15. Proportion of operating periods which ended as a result of wear and tear of lining, in %
6. Gas and mazut alternately	16. Time for repairing 1 linear meter of lining, in hours.
7. Duration of operating period, in days (1983)	
8. Specific consumption of refractory materials, in kilograms per ton	
9. Number of hot repairs	
10. Idle time during operating period, in hours	

The use of coal raises difficulties in the roasting regime and this in turn brings about a reduction in the operating period and a large specific consumption of refractory materials. The regime is characterized by the greatest wear and tear of a lining (end of burnout) and the smallest length of the sector replaced taking place at the hot end of the sectors. Operational difficulties are the cause of a large number of stoppages and idle time and they are also the reason for a very low proportion of operating periods which come to an end owing to deterioration of linings.

In 1983, coal was used as fuel for more than 20 percent of the operating periods. Such enterprises require both organizational and scientific assistance. The fact that improvements are possible in this area is borne out by the example of the Punane Kunda plant, which used slate and which had an operating period duration of 200 days.

Differences also exist in the indicators for other types of fuel. Attention is drawn to the low consumption of refractory materials and to the extended service life of linings in furnaces which operate on the basis of mazut, despite the fact that the diameter of these units is on the average greater than that for the remaining groups. Here the coefficients of use for the equipment and the

number of operating periods which terminate as a result of lining deterioration are the highest. Many hot repairs must be carried out on those furnaces which operate on the basis of alternate use of gas and mazut. However, all of these differences require more detailed classification than those which are typical of units which operate on the basis of coal fuel and additional studies are needed.

In 1984, the data on the durability of linings was processed for the very first time using new programs on an EC type EVM /electronic computer. The new system was created based upon SIRIUS applied program packages (PPP) -- for servicing the data base /1/ and VMDP -- for statistical processing /2/.

Such an arrangement ensures flexibility and low labor-intensiveness in carrying out the servicing. SIRIUS includes equipment which makes it possible to organize efficiently the storage and introduction of information and also the formation and printing of reports. The PPP VMDP includes 25 different programs for statistical processing and also convenient means for the grouping and conversion of initial data.

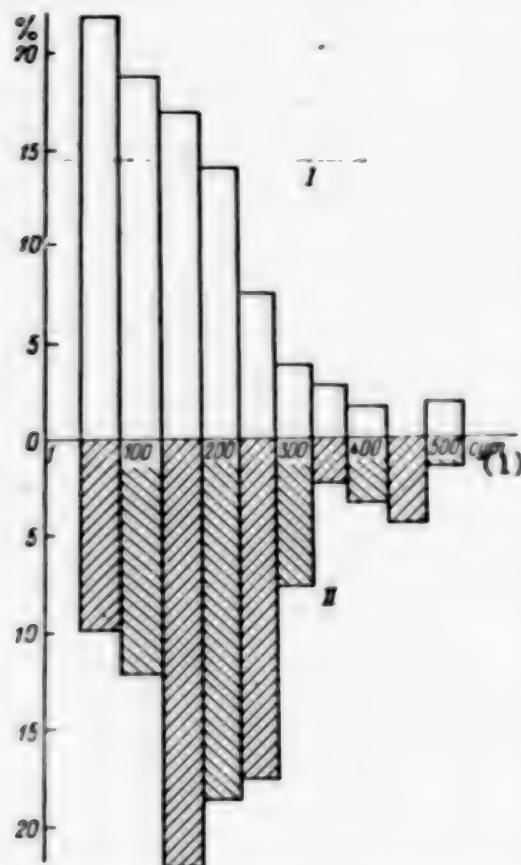
The use of the powerful means embodied in the PPP is expanding considerably the opportunities for performing analysis, but at the same time it requires a more cautious and thoughtful attitude with respect to the initial data and also the results obtained. Let us examine the nature of the problems that arise, using as an example an interpretation of the average values.

If we compare the average duration for an operating period during 1983 (229 days) against the first line in Table 3, then it is apparent that in the Table this indicator is considerably lower and that the number 229 cannot be obtained by a simple averaging. The operational periods for linings in furnaces measuring 5 meters in diameter, as shown in Tables 1 and 2, are also included in the data. This is explained by the fact that the averaging here is carried out using a different method. The number 229 was obtained as an average for the plants, that is, the sum of the average durations for the plants divided by their number. In Table 1, use was made of average data for the furnaces and in Tables 2 and 3 -- average data for the operating periods. The distribution for the duration of individual operating periods and the average values for the operating periods by plants are completely different (see diagram). In particular, the distribution of the average values for the operating periods is noticeably closer to the symmetrical bell-shaped curve of normal distribution and this corresponds to the central maximum theorem.

Another example -- the specific consumption of refractory materials, which is often used for computing the funds available. The specific consumption is equal to the ratio of the consumption of refractory material to the production of clinker. For computing the funds available, the specific consumption must be computed as the ratio of the average consumption to the average production. However, in some instances, for example during regression analysis, use must be made of the average data for specific consumption, which as a rule is considerably greater than the information obtained using the first method.

Even more complicated situations arise when interpreting the ratings for spread-dispersion and the coefficient of variation. During all stages of analysis, it

will be necessary to take into account the origin and methods for processing the data and the applicability of the various criteria for evaluating the results obtained.



Distribution of the duration of the service life of linings  
by operating periods and the average value for this indicator  
by plants:  
I. Operating periods  
II. Plants  
(1). Days

The potential of the developed system should never be considered as completely mastered. As more experience is accumulated, both the questions studied and the analytic methods employed will become more intense and expansive.

The following recommendations can be made based upon the results of analysis:

...for the purpose of improving the operation of linings in furnaces measuring 5 meters or more in diameter, considerable importance is attached to solving the organizational problems, particularly those associated with repairs (the main administrations of USSR Minstroymaterialy are coping with this task most successfully);

...when evaluating the effectiveness of furnace modernization, it should be borne in mind that an increase in their diameter is accompanied by a reduction in the duration of the inter-lining operating periods (by roughly 30 days per month);

...when selecting a coal fuel, consideration should be given not only to its thermal-technical properties but also to the effect on the formation of a coating and wear and tear of the lining, for which purpose appropriate forecasting methods must be developed;

...plants which operate on a coal fuel basis must have a powerful repair service.

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CSO: 1821/036

CONSTRUCTION MACHINERY AND EQUIPMENT

UDC 624.073.7

DESIGN FEATURES, APPLICATIONS OF NEW ROAD COVER DESCRIBED

Moscow BETON I ZHELEZOBETON in Russian No 4, Apr 85 pp 22-24

Article by L.N. Yudin, engineer at the All-Union Scientific Research Institute for Transport Construction: "Plastic Connection of a Flexible Reinforced Concrete Covering"

Text Reinforced concrete coverings consisting of large-size prefabricated elements serve as a means for protecting the dirt slopes of hydraulic engineering and transport installations, using an industrial technology, against destruction by current or waves. The bending moments which arise during technological operations are eliminated by means of linear hinges with a pitch of  $C = 0.3 \dots 0.75$  meters, in the form of a breaking up of the concrete bed into small elements. The author has proposed flexible laminated and latticed coverings, the linear hinges of which include steel-polymer plastic connections (see Figure 1). Usually this steel reinforcement  $\mathcal{B} 5 B-1$ , in accordance with

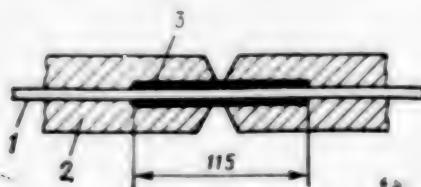


Figure 1. Linear hinge with a plastic steel-polymer connection  
Key:

1. Steel reinforcement  
2. Concrete covering

3. Polyethylene casing

GOST State Standard 6727-80 for a covering, is embedded in a sector 115 millimeters long in a casing 2 millimeters thick made out of thermo-photo-stabilized polyethylene of a high density for the basic marks 207 and 208 in accordance with GOST 16338-77. In the absence of large stresses during the period of operation, low density polyethylene is used in the reinforcement in accordance with GOST 16337-77. The casings are formed using the thermo-pressing method. The steel in the casings has a raised work capability as a result of

\*A.C. No. 251463. L.N. Yudin, I.R. Petrashev, G.Z. Elenson. Reinforced Concrete Covering for Slopes -- Discoveries, Inventions, Industrial Models and Commercial Symbols, 1969, No. 27.

an expanded area of plastic deformations, reduced curvature during bending and protection against corrosion [1].

Mark M300 and M400 concrete is used in the proposed flexible coverings. The expenditure of polyethylene per square meter is 0.07 kilograms and steel -- 1.3-3 kilograms, that is, several times less than that for similar structures.

Flexible slabs 5-15 centimeters thick are produced at a ZhBK [reinforced concrete structures] plant in an area of 12-20 square meters and thereafter covering sectors are prepared from them in the required sizes. Along 1,481 kilometers of the BAM [Baykal-Amur Trunkline], slopes along the Nyukzha River were strengthened using flexible slabs 15 centimeters thick and 13.5 square meters in area (see Figure 2), in which the maximum formations occurred during transport operations, with bending to a radius of 2.5 meters [2].

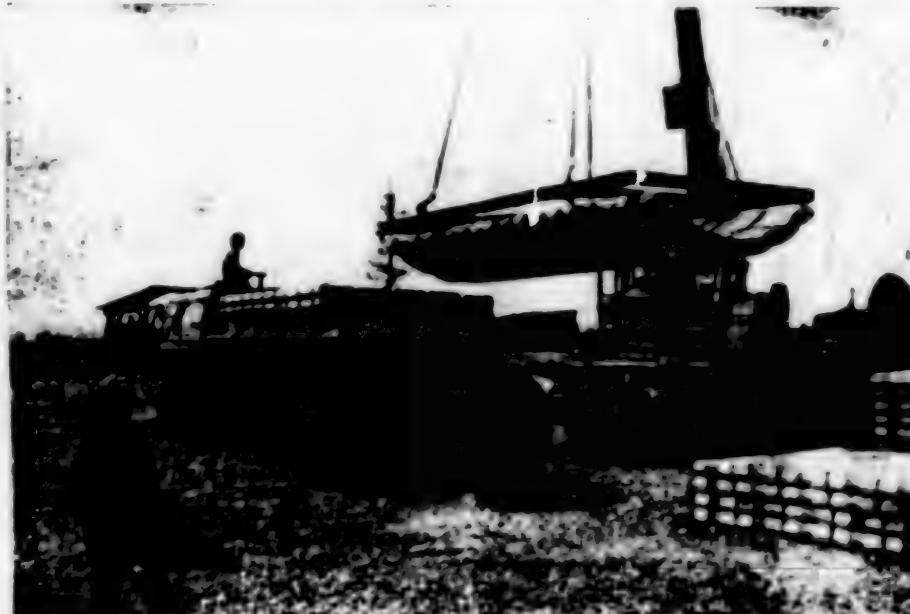


Figure 2. Bending of a slab according to catenary line  $R_{MIN} = 2.5$  meters during the construction of BAM.

For protecting a submerged slope at a pier in the port of Reni on the Danube River, a covering more than 300 square meters in area was assembled using slabs that were 5 centimeters thick and 20 square meters in area. It was reeled onto a drum 3 meters in diameter and subsequently unrolled under water to a depth of up to 20 meters by a floating crane (see Figure 3). The flexible grid coverings with a cell depth of 5-20 centimeters are assembled from units 10-20 square meters in area, with subsequent filling of the cells with gravel and rocks. The units are assembled by creating a constant net-like structure consisting of flexible chains 3-4.5 meters in length and with a cross section of 5 X 5 and 12 X 20 centimeters, produced at a ZhBK plant using the bale method. On the slopes of approach embankments to a bridge across the Dnepr River not far from Kherson, units 20.25 square meters in area (see Figure 4) were assembled from 12 garlands 4.5 meters in length and with a cross section of 7.5 X 20 centimeters (3).

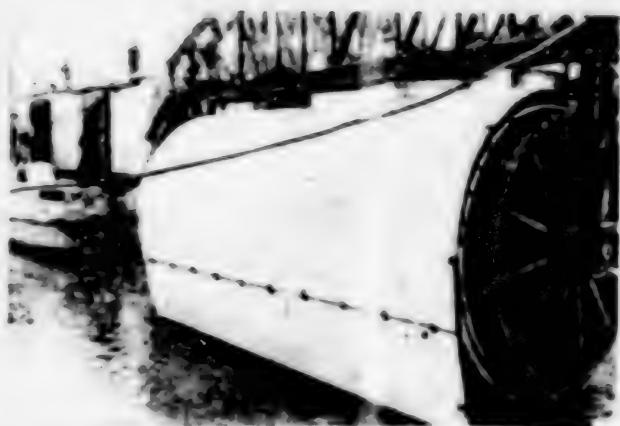


Figure 3. Placement of covering under water from a drum on the Danube River

Four criteria for the working efficiency of a steel-polymer plastic connection for a flexible covering determine its reliability during an operational period or while technological operations are in progress -- fatigue breakdown, puncturing of the polyethylene casing by a steel rod, corrosion resistance of the steel in the casing, frost resistance of the concrete in the area of the connection. These criteria were studied experimentally using fragment-samples of the structure in its natural dimension.

For a free length of the connection in a linear hinge of approximately 1-2 millimeters, its repeated bending at an angle of  $\delta = 57.3^{\circ}$  C/R, the maximum value for which does not exceed  $12^{\circ}$ , is accompanied by plastic deformations and fatigue phenomena in the steel and polyethylene. A reduction in the strength of the steel from  $P_o$  to  $P_n$  and the formation of cracks in the polyethylene from the number of bending cycles  $n$  in the temperature range  $t = (20...-40)^{\circ}\text{C}$  describes the working efficiency of the connection mainly during technological operations. Usually the total amount of bending cycles with maximum deformations at an angle of  $\delta = 12^{\circ}$  throughout the entire technological chain does not exceed 30. Three types of samples were studied -- "bare" steel, steel in a polyethylene casing, concrete fragments of a linear hinge measuring  $5 \times 10 \times 50$  centimeters with a steel polymer connection. In an automatic unit located in a freezing chamber, the samples were subjected to bending with angles  $\delta = 5...18^{\circ}$ . For samples of each type and for various temperatures and angles, a maximum number of bending cycles  $n_p$  resulted in the complete destruction of the sample. The intermediate values for the strength  $P_n$  from the number of cycles  $n$  were determined on a disruptive machine for the steel and visually for the polyethylene.

Based upon the study results for more than 800 samples, it was established:

...the connection loses strength up to  $P_n = 0.9 P_o$  (see Figure 5) during the initial bending cycles  $n = (0.05...0.07)n_p$ , the strength remains constant at this level up to  $n = (0.6...0.8)n_p$  and thereafter it falls sharply with complete destruction  $P_n = 0$  when  $n = n_p$ . For a reinforcement measuring 5 mm in diameter and when  $\delta = 18^{\circ}$ , the absolute value for the number of cycles for destruction is  $n_p = 650...700$  when  $t = 20^{\circ}\text{C}$ ;

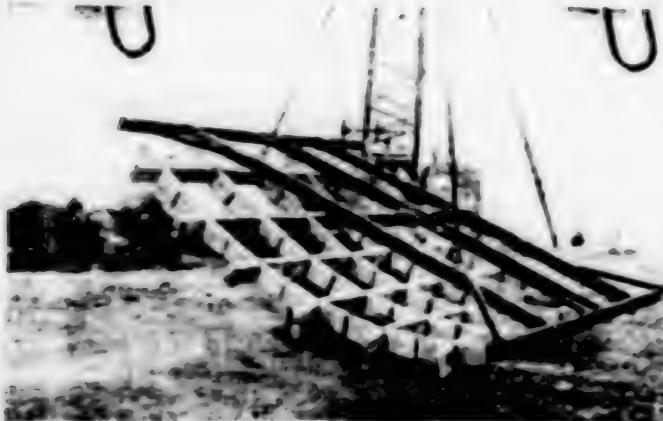


Figure 4. A flexible grid unit is moved into place on an embankment slope of a bridge across the Dnpr River at Kherson.

...for a concrete fragment of a linear hinge with a connection in the form of a "bare" reinforcement rod, the number of cycles for destruction  $n_p$  is roughly less by a factor of 2.5 than that for a fragment with a steel polymer connection;

...in the range for a change in positive temperatures from 20 to 0°C, the working efficiency  $n_p^*$  of a steel polymer connection changes negligibly and is practically constant. For negative temperatures (-20, -40)°C, the working efficiency of a connection decreases accordingly to  $n_{-20}^* = 0.25 n_p^*$  and  $n_{-40}^* = 0.5 n_p^*$ ;

...in polyethylene, on a section of high relative deformation, a surface crack initially appears over one fifth of the length of the circumference of the casing, developing to four fifths of its length and three quarters of the thickness at the moment of destruction of the steel rod. At the temperatures 20, 0, -20 and -40°C, the commencement of the appearance of cracks conforms to 300, 280, 100 and 50 bending cycles. No cracks form when  $\delta' = 12^\circ$ .

When a flexible covering is placed upon a curvilinear convex dirt surface and stretching (for example, anchor) stresses are present in the connections, a transverse force which arises in them creates conditions for cutting by the steel rod of the polyethylene casing embedded in the concrete. During an operational period, the existence of such conditions over a considerable period of time can bring about a rupturing of the elastic-plastic polyethylene up to the maximum value equal to the 2 mm thickness of the casing and it will lower to a considerable degree the corrosion protection of the steel. This phenomenon was examined during the course of laboratory experiments carried out over the course of many years on fragment-samples of a linear hinge, the steel-polymer connections of which were stretched with stresses of 2-5 kN on units which subjected the samples to a bending radius of 1.5 meters. The stresses corresponded to anchor type stresses which occur when lowering a covering 150-200 kilograms per square meter in mass over an eroded area up to 4 meters in depth. The transverse movements of the steel rod in the polyethylene casing surrounded by concrete were measured by means of hourly dial gauges relative to the concrete.

During 18 years of a tense situation, the movements of 5 mm diameter steel rods developed mainly during the first 2 years and reached a maximum value of 0.1 mm. During subsequent years, the deformations stabilized for all practical purposes and did not exceed 0.01 mm annually. It can be assumed that during the period of operation (50 years), even with the structure being subjected to constant stresses, the total amount of deformation will not exceed 0.5 mm.

The adhesion of polyethylene, a material which contains paraffin, to concrete is negligible. A plastic connection, which is embedded at the ends in concrete, may create conditions for movement of moisture along a polyethylene contour, particularly if the adjoining surfaces are loose. For the purpose of studying this process, from 1966 up until the present time at the All-Union Scientific Research Institute for Transport Construction, samples of a steel polymer connection and concrete fragments measuring 5X5X50 cm of a linear hinge were subjected to the effects of tap water and a 6 percent solution of NaCl.

Two batches of samples were maintained in these mediums in a constant moisture regime and in a cyclical regime in which the samples were dampened daily and dried every three days at an air temperature of  $t = 18^{\circ}\text{C}$ . Over a period of 18 years, the samples were moistened on 6,500 days and subjected to variable moistening in 1,600 cycles. The condition of the steel rods was evaluated according to the formation of flaws and the concrete -- according to carbonization during treatment with phenolphthalein. Towards this end and periodically with an interval of 1-3 years, the concrete of the next batch of samples was cut away along the reinforcement and the polyethylene casing removed from it.

The following facts were established based upon studies carried out over a period of many years:

...in an aggressive medium involving a cyclical regime, a "bare" rod is fully destroyed by corrosion by the third year; in concrete samples, the steel began to corrode in individual centers to a depth of 0.2 mm during the 5th year and in some areas it was destroyed completely with the formation of cracks in the concrete and centralized corrosion of the concrete during the 15th year; the steel rod within the polyethylene casing showed no traces of corrosion after 18 years and the surface was dull and black as a result of carbon diffusion from the polyethylene; upon contact with the polyethylene casing, the concrete showed no traces of corrosion and this underscores the absence of movement of the solution over this contour;

...in an aggressive medium and with constant moisture, the surface of a "bare" steel rod was affected by the products of oxidation by the 15th year, the diameter of the rod had decreased to 3 mm, flaws up to 0.5 mm in depth were noted and destruction took place from the ends with an intensity of up to 0.5 mm annually; by the 10 to the 15th years, the steel in the concrete samples had been destroyed by centers of corrosion 0.2-0.5 mm in depth; the concrete showed no evidence of corrosion following contact with the polyethylene;

...over a period of 18 years, in tap water and with constant and cyclical moisture, there were no traces of corrosion on the reinforcement in the concrete or in the concrete along the contour with the polyethylene.

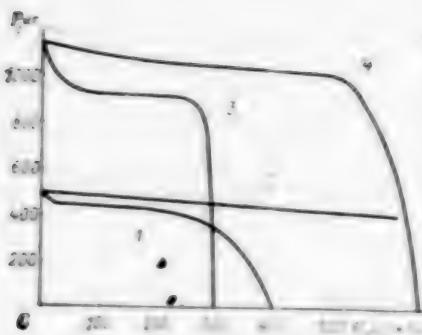


Figure 5. Losses in strength in a connection of a linear hinge, caused by the number of bending cycles.

Key:

— 03 —  
— 05 —

1, 3 Steel without a casing  
2, 4 Steel polymer connection.

Compared to concrete, polyethylene possess a higher temperature coefficient for volumetric deformation and a lower coefficient of elasticity. Film water which penetrates along the polyethylene - concrete contour during freezing creates a tensile situation, the results of which are evaluated on the basis of tests for frost resistance. A frost resistance study was carried out on 50 concrete sample-fragments of a linear hinge measuring 5X5X10 cm, with a steel polymer connection included in it, and 50 standard small concrete cubes with a 10 cm edge. For these samples, use was made of concrete containing SSB and SMV additives in the amount of 0.1 and 0.2 percent of the mass of cement. The tests were carried out using the accelerated method of GOST 10180-80, at the freezing temperature of  $-50^{\circ}\text{C}$ , while continually determining the strength of the control groups and samples which underwent freezing with an interval of 100 cycles. The frost resistance of the concrete of standard small cubes was determined on the basis of compression strength in accordance with GOST 10060-76 and the fragments of the linear hinge by separation in accordance with GOST 10180-80. Tests established the fact that when the separation method is employed the plane of destruction takes place directly in the zone of the plastic connection and a change in the strength of the concrete in this zone is determined more accurately.

The tests revealed that the concrete used had a frost resistance grade of Mra 600...700. The reduction in strength in the samples with a steel polymer connection, determined using the separation method for 600 cycles, amounted to 0.7. No changes were observed upon contact with the polyethylene on the surface of the concrete. On the faces of the samples, directly where the polyethylene enters the concrete, gossamer cracks appeared which caused flaws ranging in depth up to 5 mm to occur every 1,000 cycles.

#### Conclusions

Laboratory tests carried out over a period of many years on the criteria for the working efficiency of a plastic connection make it possible to assume an adequate reliability for the structure proposed for a flexible covering to be used during technological operations and work carried out over a period of

many years. This forecast is borne out by the experimental-industrial and mass construction started in 1967 and by subsequent studies carried out on the condition of the structures.

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CSO: 1821/040

CONSTRUCTION MACHINERY AND EQUIPMENT

POSITIVE RESULTS WITH DRY PROCESS IN CEMENT PRODUCTION NOTED

Moscow STROITELNAYA GAZETA in Russian 25 Aug 85 p 2

Article: "Navoi Dry Cement"

[Text] The workers of Uzbekistan, similar to all Soviet people, are confronted by difficult and basically new tasks, as set forth in the decisions handed down during the April (1985) Plenum of the CPSU Central Committee and the June conference in the party's central committee on the question of accelerating scientific-technical progress.

In this regard, the experience of the Navoi Cement Plant is deserving of attention. It provides a clear example of exactly what a labor collective can do towards introducing scientific and engineering achievements into operations, if it is truly united and concerned with solving the large-scale and long-range task.

To what extent is the experience of the cement workers valuable? This question is discussed by the plant's director, T. Tashpulatov.

A progressive technology for cement production, using the so-called dry method, has been introduced into operations in our republic for the very first time. The following figures testify to its effectiveness.

If we made cement using the traditional "wet" method, then we would have had to consume up to 130,000 additional tons of standard fuel annually, with the value of such fuel amounting to almost 2 million rubles.

In addition to this fuel savings, it is also noted that the expenditure of deficit furnace refractory material is reduced by threefold and, in addition, the installation of a complex having two "dry" furnaces requires only one half the amount of metal required when use is made of the "wet" method.

Certain other technical-economic indicators also warrant mention. For example, labor productivity is raised by a factor of 1.4-1.6. Whereas the "wet" furnaces rapidly exhaust their potential, when use is made of the "dry" method the productivity of the furnaces reaches 5,000 tons of cement daily. We presently have a furnace unit which has a daily capability of 10,000-12,000 tons.

In mastering the new technology, we had to overcome a number of difficulties -- using our own resources, we had to improve and place in proper working condition many units and assemblies. In particular, large volumes of work were carried out in connection with the modernization of a crushing-sorting shop, a department for correction and reserve silos of raw meal, a flue gas circuit and the transporting of clinker and cement. The valuable works and recommendations of our collective are presently being used in the erection and modernization of similar enterprises which are introducing the "dry" method of cement production into operations.

During the course of mastering these innovations, the entire plant was for all practical purposes modernized and the idea arose of further developing long-range production. USSR Gosplan and USSR Minstroymaterialy [Ministry of the Construction Materials Industry] approved recommendations by the Navoi cement workers concerning the installation of a considerably smaller rotary furnace in the third technological line. For the same productivity, the dimensions of the furnace can be reduced through the installation of an additional reactor-decarbonizer. In the process, the capability of the entire line increases by 150,000 tons of cement annually, metal consumption decreases by 1,200 tons, fuel -- by one and a half to two percent more, electric power -- by 10-12 percent and the durability of the refractory lining will be 150-200 days -- or 2-3 times more than that for existing furnaces. According to computations by economists, the introduction of the third technological line of the "dry" method will enable our plant to produce one half of all cement being produced in the republic.

Unfortunately, Minstroydormash [Ministry of Construction, Road and Municipal Machine Building] and USSR Minstroymaterialy, notwithstanding the persistence of the plant workers and the republic organizations, are postponing the schedules for carrying out the all-round measures aimed at increasing the planned capability of the "dry" method line to 3,000 tons of cement daily. The fear exists that this work may be dragged out still another 5 years if Minstroydormash and Yuzhgiprotsement are unable to eliminate the bottlenecks in an efficient manner. We have many complaints with regard to the general contractor -- the Navoi Construction Administration. Its collective has failed us on numerous occasions.

The conversion of the economy over to the path of intensification demands that efforts be concentrated on the practical carrying out of those tasks concerned with scientific-technical progress.

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CSO: 1821/031

CONSTRUCTION MACHINERY AND EQUIPMENT

MEASURES FOR ACCELERATING SCIENTIFIC-TECHNICAL PROGRESS IN CONSTRUCTION

Moscow MEKHANIZATSIIA STROITELSTVA in Russian No 10, Oct 85 pp 1, 31, 2-5

Table of Contents, Synopses of Articles and Lead Article by Ye.V. Spiridonov,  
1st deputy minister for construction, highway and municipal machine building:  
"Carrying Out the Decisions of the Party"/

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## **SYNOPSIS OF ARTICLES PUBLISHED IN MEKHANIZATSIIA STROITELSTVA, OCTOBER 1985**

UDC 69.002.5:65.011.54.

### **NTP: ALL-ROUND MECHANIZATION AND A PROGRAM FOR REDUCING EXPENDITURES OF MANUAL LABOR IN CONSTRUCTION**

[Synopsis of article by Yu.S. Vostrikov, p 4]

[Text] Information is furnished on work carried out by construction ministries aimed at reducing expenditures of manual labor in subordinate organizations and on the tasks of construction organizations when developing measures for the mechanization and automation of construction production, in the form of plans prepared by them for special purpose all-round programs aimed at reducing the use of manual labor in construction during the 1986-1990 period and for the period up to the year 2000.

UDC 624.132.345."71"

### **METHODS FOR ACHIEVING PROGRESS IN HYDROMECHANIZATION**

[Synopsis of article by B. M. Shkundin, p 7]

[Text] Large reserves for raising the efficiency of hydromechanization are cited in the article, reserves which can be realized by accelerating the introduction of a number of approved scientific and design works. A brief review of such works is provided: submersible dirt pumps, sluice feeders, aggradation from overhanging pulp lines, multiple unit operational method and others. Bibliography: six titles.

UDC 621.315.235.002.5.

## GENERAL PURPOSE COMPLEX FOR THE CONSTRUCTION OF CABLE LINES OF COMMUNICATION

[Synopsis of article by V.G. Koreltsev, p 18]

[Text] The KNV-1-K cable-laying complex is intended for laying mainline cable communications on runs of any length to a depth of up to 1.2 meters. In order to be able to lay cable on waterlogged soils and during the spring period of bad roads, the complex is equipped with special shoes which make it possible to traverse confidently sectors of a run characterized by a weak supporting surface. When necessary, the complex can be used for laying, parallel to the cable, a lightning protection line which protects the cable against the effects of atmospheric electricity.

The annual economic effect realized from the use of the complex is 191,000 rubles. One illustration, bibliography: 3 titles.

UDC 693.28.

## IMPROVING THE TECHNOLOGY FOR DELIVERING BOILER UNITS IN UNIT FORM

[Synopsis of article by A.K. Kosenchuk and Ya.M. Turchinskiy, p 20]

[Text] The traditional system for delivering technological boiler units is mentioned in the article. Based upon analysis, a list is furnished of the problems which arise during the delivery process. A new system is proposed for the delivery of boiler units and recommendations are made for creating new transport equipment for shipping the units, embodying self-unloading means. Two illustrations and one table.

## 1ST DEPUTY CONSTRUCTION MINISTER REPORTS ON ACHIEVEMENTS, TASKS

Moscow MEKHANIZATSIYA STROITELSTVA in Russian No 10, Oct 85 pp 2-5

[Lead article by Ye. V. Spiridonov, First Deputy Minister for Construction, Highway, and Municipal Machine Building: "Carrying Out the Party's Decisions"]

[Text] The carrying out of the grandiose tasks concerned with the economic and social development of the USSR is dependent to a large degree upon the status of capital construction, by means of which the technical re-equipping of all branches of the national economy must be carried out based upon the introduction into operations of the achievements of scientific-technical progress. More than 66 billion rubles worth of capital investments were employed in construction during the first 6 months of 1985 alone: new production capabilities were introduced into industry, agriculture, transport and other branches of the national economy; 34.5 million square meters of dwelling space were built and a number of main gasline sectors the overall length of which was 4,700 kilometers were installed and the linear portion of the Urengoy-Tsentralnaya-II gas pipeline was completed ahead of schedule.

An acceleration in the rates for raising labor productivity, an improvement in quality and an improvement in the economic efficiency of construction operations -- these then are the vital tasks which must be solved with the active participation of the machine builders.

The foundation for forming the pool of modern construction equipment is the output of Minstroydormash [Ministry of Construction, Road and Municipal Machine Building], which numbers approximately 1,800 types of machines, the annual delivered volume of which is valued at approximately 4 billion rubles, including more than 33,000 excavators, 42,000 bulldozers, 11,000 scrapers, 19,000 vehicle-mounted cranes, 2,000 tower cranes and others.

At the beginning of this current year, the pool of machines and transport equipment in construction included more than 170,000 excavators, 43,800 scrapers, 162,000 bulldozers, more than 218,000 cranes of various types and also a large quantity of other machines, mechanized instruments and technological equipment.

During the course of the current five-year plan, Minstroydormash continued to increase the production and delivery to construction of hydraulic excavators equipped with hydraulic hammers, grab buckets and attached items of equipment for levelling work and the sinking of drill holes. An increase took place in the production of hydraulic cranes with telescopic beams and mobile tower cranes with a raised lifting capability and a greater freight lifting height. Increases took place in the production of automatic units for the preparation of concretes, solutions and asphalt-concrete mixtures, powerful bulldozers on T-330 tractors and other construction equipment.

The production of highly efficient construction-finishing machines and mechanized construction-installation instruments has been mastered in recent years. Each year the builders are supplied with thousands of highly efficient painting units for the vacuum dispersion of painting compounds, machines for the preparation and delivery of plastering solutions and mixtures, electric hammers and perforators, nut wrenches, electric drills, construction-installation guns, pneumatic punchers and other similar means of mechanization.

The new machines are characterized by a raised productivity, reliability and reduced fuel consumption.

At the present time, more than 90 percent of the principal labor-intensive construction operations at construction sites are being carried out with the use of machines. However, notwithstanding the rather high level of mechanization for individual types of work, the average level of mechanization for construction is clearly lagging behind the requirements of the times. The rate of growth for labor productivity is inadequate (from 1975 to 1984 -- by 23 percent).

An important reserve for raising labor productivity in construction is that of improving the structure of the pool by increasing the proportion of machines having great individual power and also miniaturized equipment.

In the plan for 1985, the ministry calls for progressive changes in the production structure based upon optimization of the production program, the accelerated creation and mastering of new and highly efficient equipment and the development of more progressive types of machines which will produce the greatest effect in the sphere of consumption.

In 1985 the enterprises of Minstroydormash will produce 36,600 excavators, with the entire increase to be achieved by means of more productive machines with a bucket capacity of 0.63-2.5 cubic meters; an increase of 10 percent will take place in the production of excavators of a raised durability on a caterpillar undercarriage of the tractor type, with the production of interchangeable types of attachable equipment undergoing leading development.

The 1985 plan calls for an increase in the production of large scrapers by means of a reduction in the production of low capability scrapers. Two hundred scrapers with a capacity of 7-8 cubic meters (with wheeled K-700 tractors), used instead of scrapers with a 3 cubic meter capacity, will make it possible to release 1,000 workers and thus produce a savings in the wage fund of more than 3.5 million rubles annually.

The series production of bulldozers on T-500 tractors is planned to take place for the very first time in 1985.

A substantial change will take place in the production structure for vehicle-mounted cranes, with an increase taking place in particular in the production of vehicle-mounted cranes with a freight lifting capability of 10, 12.5 and 16 tons. The production of tower cranes will increase by 10.3 percent.

In 1986 the delivery requirements for hydraulic excavators with a bucket capacity of 1.6 and 2.5 cubic meters will be satisfied almost completely and increases will take place in the production of pipe laying units with a lifting capability of 50 tons and mounted on a TT-330 tractor base, in vehicle cement mixers, in jib cranes mounted on special motor vehicle undercarriages and having a lifting capability of 25 and 40 tons and in other machines and items of equipment.

In order to achieve a substantial reduction in the proportion of manual labor, production must be increased, the nomenclature expanded and an increase achieved in the technical level of mechanized construction-installation instruments and finishing machines. In accordance with the 1985 plan, the production of perforators will increase by 30,000 units or by a factor of 1.5, the production of plastering and painting stations -- by 30 percent and roofing machines -- by 15 percent.

It bears mentioning that considerable reserves are to be found in the use of the mechanized instruments and construction-finishing machines being produced for construction by Minstroydormash.

Experience has shown that the effectiveness of equipment usage increases when it is concentrated in specialized administrations for light mechanization, when instrument-distribution points are created at the construction sites and when the brigades are equipped with normal kits. In the process, labor productivity will increase by 15-20 percent, the preservation and working efficiency of the light mechanization equipment will be ensured and, it follows, the shortage of such equipment will decline. The shift output for painting operations will reach 30-35 square meters and for plastering work -- 20-22 square meters per worker. At the same time, when use is made in the leading brigades of Glavmospromstroy [Main Administration for Industrial Construction of the Moscow City Soviet of Workers' Deputies] of the highly productive and

high pressure units supplied by Minstroydormash, the shift output per worker reaches 500-600 square meters. Thus, compared to the use of pneumatic sprayers, the losses in painting compounds decrease by 30 percent, improvements are noted in the working conditions for the painters and the quality of the work carried out improves.

The 1985 state plan for economic and social development assigned tasks to Minstroydormash in connection with the development of 62 new types of industrial products, including: a single-bucket excavator with a bucket capacity of 2.5 cubic meters and with a hydraulic drive on a caterpillar undercarriage of the tractor type; a set of DS-150 machines for the rapid construction of local roads; a fixed hydraulic concrete pump with a productivity of 60 cubic meters per hour (SB-161), jib cranes with a lifting capability of 63 and 100 tons on a caterpillar undercarriage; a motor vehicle crane with a lifting capability of 16 tons on a KamAZ motor vehicle undercarriage and others.

A miniature TO-31 excavator-transport machine with a bucket capacity of 0.1-0.2 cubic meters and other types of detachable working equipment is being developed at an enterprise of the Lenstroyrobot NPO [Scientific Production Association]. The builders need these machines for replacing manual labor at low-volume operations, where large items of equipment cannot be used effectively.

In 1985 the Balakovo Plant for Self-Propelled Excavating Machines will provide the land reclamation specialists with a batch of self-propelled DZ-107-2 twin-motor scrapers, with a bucket capacity of 25 cubic meters and a coupling for carrying out work as part of a scraper train and the Bryansk Plant for Irrigation Machines -- a batch of general purpose spiral-rotary excavator-canal diggers (ZTR-208) for the construction of canals ranging in depth up to 2 meters.

The 1985 task calls for the Mozyr Plant for Land Reclamation Machines to produce 80 MD-12 drain-layers for the non-trench laying of plastic drainage pipe to a depth of 1.6 meters on drained lands, with the efficiency and productivity of drainage operations increasing by a factor of 1.5-2 in the process.

For the repair of road surfaces, the plans call for mastering the series production of a basically new machine of the Remikser type for the repair of asphalt surfaces. The annual savings realized from the use of these machines will amount to 3,000 tons of petroleum-bitumen and 23,000 cubic meters of gravel, with 60 workers being released from having to perform heavy manual labor in the process.

In addition to the creation of new machines, a great amount of work is being carried out in connection with the renovation of serially produced equipment. In 1985, 263 types of machines must be modernized or removed from production and replaced by new and more improved types. This will require 120 technical and working plans for machines, the production of 56 experimental machines and the carrying out of tests on 72 models.

A great amount of preparatory work is being carried out in 1985 and the necessary prerequisites are being created for the successful development and production during the first year of the 12th Five-Year Plan of industrial series of new types of important and progressive machines.

The scale of this work is illustrated by a simple enumeration of the machines: an excavator of the 4th dimensional group on a tractor type caterpillar drive with an economic hydraulic drive system and interchangeable working equipment (EO-4125); a BM-4000 (4001) drilling machine for the installation of vertical and inclined piles up to 1.7 meters in diameter, with an enlarged fifth depth of drilling to 40 meters; a twin-motor DZ-107-2 scraper, with a bucket capacity of 25 cubic meters and a coupling for use as part of a scraper train and also a DZ-155-1 scraper on a single-axle BelAZ-531 tractor; an SB-159 vehicle cement mixer with a prepared mixture volume of 5 cubic meters on a KamAZ-5511 motor vehicle chassis; cranes with a lifting capability of 25 and 40 tons and a telescopic beam on a short-base chassis; a self-propelled jib crane with a hydraulic drive and telescopic beam and a lifting capability of 250 tons; a mobile tower crane with a rotating tower, a lifting capability of 10 tons, a lifting height of 40 meters and a freight moment of 160 ton-meters; a set of equipment for processing monolithic concrete coatings using the vacuum method; a set of equipment for the production of asbestos cement pipe with a productivity of 1,200 kilometers of pipe annually; an equipment complex for the SMK-350 technological line for the production of 75 million bricks annually; a set of equipment for a technological line for the production of reinforced concrete sleepers, with a capability for producing 32,000 cubic meters of sleepers annually and others.

The mastering of new and highly productive machines and accelerated increases in their production volumes will make it possible to improve the specific indicators: to raise, by the end of the 12th Five-Year Plan, the average bucket capacity of fully-rotatable excavators and scrapers, the average power rating of powered graders, the average lifting capability of motor vehicle cranes and the average traction class of bulldozers.

A considerable amount of work is being carried out in the ministry in connection with raising the technical level and quality of the products being produced based upon technological improvements. It is expected that in 1985 the proportion of goods of the highest quality will amount to 38 percent of the overall marketable production.

One condition for further raising the effectiveness of use of construction equipment is that of ensuring the production not of individual types of machines and equipment, but rather machine systems and complexes which will ensure the complete mechanization of the technological processes. According to the situation for 1984, 482 machines were mastered; in accordance with the plan for 1985, 57 machines will be mastered, machines which have already been included in systems and complexes coordinated with the client. The plans call for 100 more machines to be mastered during the 12th Five-Year Plan, all of which are included in the principal systems and complexes.

One of the more effective means for raising the coefficient of use of equipment and reducing manual labor is that of making available quick-detachable items of equipment and equipment having a broad nomenclature of diverse working organs. This makes it possible to expand the area of effective use of machines and to convert them into multi-purpose machines. In a number of instances, it also makes it possible to reduce considerably the required pool of machines and this is of considerable importance with regard to the construction of dispersed projects involving low work volumes in remote regions of the country, in rural construction and in the modernization of buildings. Thus an increase in the nomenclature for interchangeable types of working equipment and working organs

for hydraulic single-bucket excavators makes it possible to raise the coefficient of use by a factor of 1.3-1.5 and to mechanize a number of operations in which manual labor is employed.

The creation of automatic lines and complexes and the automation of control over operating processes constitute an important trend in the development of construction machine building. For the 12th Five-Year Plan, the plans call for the creation and mastering of the production of automatic units which will ensure the stabilization of the optimum work regimes for power, drive and transmission systems, regardless of constantly changing conditions in the workloads for the working organs of the machines, which interact with a medium that differs in terms of durability (ground, asphalt and concrete mixtures, rock materials and so forth).

In the future and depending upon the workload regime, bulldozer-rippers, scrapers, power graders, multiple-bucket rotary and chain excavators, trench and non-trench drain layers, spiral-rotary and snow crabs and other self-propelled machines should all be equipped with systems for automatically changing the speed.

Use will be made of energy-conserving systems: automatic reduction in the supply of fuel to an engine while idling, recuperation on an engine's flywheel of the kinetic energy of the rotating platform when the rotating mechanism is braked and local recuperation in the hydropneumatic battery of the potential energy from a lowering of the working equipment. Such systems, created at the Kalinin, Kovrov and Voronezh excavator plants, ensured a reduction in specific fuel expenditures of 8, 16 and 28 percent respectively (by plants), with an increase of 5-8 percent in the technical productivity of the excavators.

The further development of micro-processor equipment, in conformity with construction production, must serve as the foundation for the creation of automatic systems for the remote control of machines having television control. The creation of construction manipulators and robots is called for in the near future.

An acceleration in scientific-technical progress as it applies to construction equipment is being promoted by the standardization of machines and the specialized production of standard parts for general use -- modules. For the 12th Five-Year Plan, the plans call for the extensive use of the module principle for planning the principal types of construction and road machines and this calls for the creation of:

...in excavator construction -- module elements for power units, undercarriage units, working equipment for control systems, cabins;

...in crane construction -- module elements for the larger crane models of dimensional groups I-VI: with upper rotation (mobile and attached) and with lower rotation in a mobile form;

...in excavator-transport machines -- modules for power units, transmission systems, undercarriage systems, safety systems, automatic control systems, working equipment of cabins;

...in vibration-impact machines -- modules for impact parts.

This progressive principle for the design of new equipment is being employed in a majority of the new machines and items of equipment being created.

The unit-module method for planning, based upon automatic planning systems (SAPR), is the highest organizational stage for design studies and it ensures a considerable acceleration in the schedules for creating new equipment and for raising the degree of standardization and the interchangeability of design elements. The introduction of this principle into operations will make it possible to create a large number of designs with a considerable reduction in the nomenclature for a number of basic elements and to organize high quality unit repairs with reduced expenditures of resources and time.

Measures being carried out at the present time and planned for the 12th Five-Year Plan, in connection with improving construction equipment and ensuring that construction is supplied with such equipment, and in addition to improving the technology for construction operations, the use of more effective types of construction materials and designs and raising the thoroughness with which the plans for organizing operations are prepared and carried out, will undoubtedly promote an increase in labor productivity, the release of workers performing manual labor and raise the quality and efficiency of construction-installation operations and serve as an important lever for accelerating scientific-technical progress in construction.

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## CONSTRUCTION METHODS AND MATERIALS

### MORE ENERGY EFFICIENT METHOD OF CONCRETE PRODUCTS PRODUCTION

Moscow IZOBRETEL I RATSIONALIZATOR in Russian No 6, Jun 85 pp 10-11

[Article by A. Ushakov, engineer: "Concrete Knows Best..."]

[Text] Concrete, the largest output product in the modern world, is prepared from raw materials which are extremely diverse in their characteristics. But all are processed identically. This leads to unnecessary expenditures of energy. Is it not possible to change this situation?

The specialists at the Volgograd Engineering-Technical Institute and Scientific Research Institute of Reinforced Concrete (NIIZhB) maintain that, if the process of hardening concrete is understood, then it would be possible to individually process each concrete article. They developed an uncomplicated electronic device. With the help of this instrument the concrete "selects" the appropriate processing conditions. The implementation of these inventions promises appreciable energy and resource savings.

At present, all concrete products are, as a rule, processed dissimilarly. The temperature conditions are first selected under laboratory conditions and then checked under production conditions. After that it is usually necessary to make corrections. This process is long, labor intensive, and far from always effective. This is due to the fact that, strictly speaking, no two concretes in the world are identical. At present there are more than 30 well known types of cement. There are also the fillers, their different ratios, and additives.... Often, sample blocks cut from the same concrete article exhibit different strengths.

It follows then, that at any mortar or concrete plant, in a literal sense, concrete is not made, but "created." Further, it is only possible to know what was created at the earliest after 24 hours, but usually only after a month, and then only approximately.

At present the country produces approximately 100 million cubic meters of prefabricated reinforced concrete products. According to the norms, each cubic meter requires up to 250,000 kilocalories of heat during steam and heat

processing. However, according to data from NIIZhB, 400,000 to 500,000 kilocalories are being used--at a cost of up to five rubles. Multiply that by 100 million...!

When E. Pishchalko, assistant professor at the Volgograd Engineering-Construction Institute, started to work on this problem, he decided to first look for the criteria which, in general terms, characterize the flow of physical and chemical processes in hardening concretes. Concrete, at the beginning of the hardening process, is an electrolyte with a huge number of free ions. After the completion of hydration process however, it is a solid in which there are practically no moving ions. This means that the electrophysical properties of concrete must vary in strict accordance with the kinetics of structure development.

He attempted to check this, but was unable to do so. It turned out that a parameter such as dielectric permeability changes so rapidly during the hardening process that no existing instrument could measure it. Pishchalko, as a materials specialist, was helped by his old love for radio technology. The assistant professor and a student, G. Petrov, prepared an instrument which was based on the studies of the student scientific group. This instrument measured the dielectric characteristics of concrete at radio frequencies. The instrument was awarded a first-level diploma at the All-Union Exhibition of Amateur Radio Designers.

New students came into the group. Among them was A. Golovchenko who was now an old teacher at that same institute. A group was formed. Subsequently the group was lead by Doctors of Technical Science B. Krylov and F. Ivanov from NIIZhB. The group succeeded in solving a number of theoretical problems and in doing so, gave a new direction to concrete technology.

First, they worked out a new method for determining the seizing period of the cement paste. It turned out that the normal means of making this determination--insertion of a probe (the venerable Vika device) in the concrete paste--was inaccurate. The periods at the beginning and end of cement setting are very important aspects that characterize cement activity. However, the probes of the Vika instrument were only able to register the beginning of the increase in mechanical strength. When the process of structural formation reaches the final stages, the cement crystal grains are developed but they are not yet adhered together. Like a group of pegs--a finger cannot be forced between them--but shake them and they fly apart. Now, when the crystal "pegs" have grown to the point that it is difficult even for ions to move between them, only then does the actual setting of the cement occur. That moment is registered by the suggested method (Author's Certificate No. 729,169) which allows more effective processing of concrete.

But the electromotive force induced in it by galvanic coupling must play the role of the signal in individual adjustments of the heat processing conditions (Author's Certificate No. 779,882). It became apparent that the electromotive force varies in strict correlation with the process of structural formation and is like a technical certificate of the concrete mixture. Moreover, the electromotive force and electrical resistance vary most intensively during the

first 10 to 12 hours after the production of the concrete mixture. That is, just when the heat-moisture treatment is taking place.

In order to measure the necessary parameters it is sufficient to install several electrodes in the walls of the form and connect them with conductors to an analog electronic device which is only slightly larger than a soap dish. This device allows the automatic adjustment of the concrete temperature depending on the magnitude of the electromotive force and electrical resistance. It is unnecessary to input any data on the composition of the concrete into the device. The device itself selects one of the best sets of temperature processing conditions for any concrete poured into the form.

Right after vibration processing, an electromagnetic valve opens at the command of the analog device and hot steam starts to heat the concrete mixture raising its temperature. Depending on the change in the parameters during the processing period, the device opens and closes the valve. When new values of electromotive force and electrical resistance are stabilized, the raising of the concrete temperature is stopped. Moreover, the maximum temperature of the concrete often does not exceed 65 to 75 degrees Celsius, which is less than normal. That is a great savings.

The Volgograd inventors, together with Candidate of Technical Sciences V. Pustylnikov created another device as well. If the hydration of the cement is proceeding very slowly, and threatens to disrupt the production process, this device switches the steaming of the concrete article from the monitored mode to the "2-3-6" mode or any other mode which has been previously entered into the device. Therefore, the production workers can relax: the forms are emptied of their articles on time. Moreover, the strength of the articles will nevertheless be greater than is achieved at present, and the energy expended will be less. Nevertheless, in the majority of cases, the process of steaming articles by the monitored follow-through [sledvashchiy] mode stayed completely within the time limits of the production cycle. During laboratory trials the energy expenditures were decreased by a factor of 1.93 of their normal level and the compressive strength of the concrete was increased by a factor of 1.41.

In this way the national economy can receive many hundreds of millions of rubles due to the energy and cement savings. Of course this can be achieved only under maximum use of these new solutions in production.

According to preliminary calculations, the cost of the analog device will be 17 rubles if the microcircuits and other radio parts are purchased at wholesale prices. That is, the device would pay for itself in one cycle of heat treating wall panels. Making such a device is uncomplicated inasmuch as the scheme of the printed circuit has already been worked out.

It is necessary to stipulate however, that at present the inventors have processing experience using the follow-through system only for concrete articles in cassette-type forms (the industrial verification was carried out at the Volgograd Plant ZhBI-1 with the participation of plant specialists). It is not yet clear how they will accomplish the steaming of articles in tunnel-type

steaming chambers. There are also several other "but's", most in the organizational realm, which can only be resolved only by joint efforts with the production workers.

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## CONSTRUCTION METHODS AND MATERIALS

### SOVIET CEMENT OUTPUT COMPARED WITH WORLD STANDARDS

Leningrad TSEMENT in Russian No 1, Jan 85 pp 1-3

[Article by A. M. Dmitriyev, candidate of technical sciences, director of NII tsement [State All-Union Scientific Research Institute of Cement Industry]; Z. B. Entin, candidate of technical sciences, chief of standardization department; and T. V. Kuznetsova, doctor of technical sciences, professor, chief of chair of MKhTI [Moscow Institute of Chemical Technology] imeni D. I. Mendeleyev: "Basic Ways of Improving Cement Product Assortment and Quality"]

[Text] Party Central Committee General Secretary K. U. Chernenko noted in a speech at a CPSU Central Committee Politburo session on 15 November 1984 that rational management means a constant improvement in product quality.

An improvement in product assortment and an improvement in cement quality in combination with conservation of fuel and energy resources are the principal tasks of our sector.

Data on the results of cement enterprise work for 1983 permit an analysis of the assortment and quality of manufactured products as well as consumption of fuel and electrical energy in cement production.

In 1983 the country produced 128.2 million tons of cement, including 118.9 million tons by enterprises of the USSR Ministry of the Construction Materials Industry. The average grade of binder increased from 40.00 to 40.83 megapascals in comparison with 1975. Production of cement of grade 500 or higher increased for that same period from 22.5 to 26.3 million tons, including an increase of 3.5 times in high-strength cement. The proportion of products in the highest quality category was 35.3 percent of the total cement output. The remaining cement was certified in the first quality category.

As before, the bulk of output consists of portland cement with 70.6 percent; this includes 8.7 percent plain cement for general construction use, 9.6 percent special cement and 52.3 percent portland cement with mineral additives (Table 1).

The share of portland slag cement production in 1983 reached 26.0 percent. Although it rose somewhat in comparison with 1980, it still remains below 1975 (27.3 percent). This cement is not produced at all in a number of the

country's regions. Taking into account that portland slag cement is the least energy-intensive type of binder, such a situation cannot be deemed progressive.

Table 1

Cement Types	Output of Basic Cement Types, %		
	1	2	3
Portland cement including plain	67.0	70.4	70.6
Portland slag cement	12.6	17.9	18.3
Portland-pozzolan cement	27.3	25.6	26.0
Other cements	3.3	3.7	3.1
	0.4	0.3	0.3

The production of pozzolan cement dropped to 3.1 percent in 1983 as opposed to 5.3 percent in 1975 and presently is not fully meeting the demand for it.

Production of this binder is concentrated primarily at six enterprises: at the Bryansktsement and the Mordovtsement production associations and at the Timlyuyskiy, Karadag, Kaspi and Ararat plants. Such cement is produced in small amounts (or for special purposes) at another nine enterprises. A shortage of it is seen in a majority of the economic regions as a result.

The product mix of cements provides for 64 type-grades [vidomarka] based on normative documentation, including 34 for general construction, 18 for special purposes and 12 for oil-well cement. Enterprises of the USSR Ministry of the Construction Materials Industry produce 13 type-grades of special cements and four types of oil-well cements, while the others are for general construction. Compared with 1972, the number of type-grades of cement for general construction purposes was reduced by eight.

It should be noted that the broad product mix of cements, both for general construction and for special purposes, is provided for by the regulatory documentation of a majority of industrially developed countries, where a trend is seen toward a considerable expansion in their assortment and an increase in the number of types and grades, which results from the need to conserve fuel and energy resources and satisfy the varied needs of construction.

In the United States, for example, where a breakdown of cement by grades has not yet been introduced, regulatory documentation provides for the manufacture of 38 varieties of general-construction binding cements (not counting decorative and alumina cements) and 16 varieties of oil-well cements.

An especially large number of type-grades of general construction cements is typical of the EEC countries. For example, French standards provide for 62 type-grades of cements for general construction, there are 26 in Spain and 30 in the FRG. In addition, these countries produce a large number of special cements, and the production of mixed cements is growing rapidly.

The assortment of cement is also very broad in CEMA member countries. The Hungarian People's Republic, for example, has regulatory documentation for 38 type-grades of cements, the People's Republic of Bulgaria has 25, and the GDR and Socialist Republic of Romania have 21.\*

\*"Cement Standards of the World Cembureau," The European Cement Association, Paris, 1980.

Multicomponent cements are the principal product of our sector. Fuel consumption is reduced by 25-30 percent, or by 5-6 million standard fuel tons per year, in the production of such cements in comparison with plain cement.

The experience of producing multicomponent cements in our country is being adopted rapidly by developed capitalist countries, especially in the EEC. The average introduction of additives to cements in these countries was 17 percent in 1983 (it was 22 percent in the USSR), and it will increase to 30 percent by the year 2000.

According to a forecast by the EEC's Cement Bureau, by the year 2000 the proportion of multicomponent cements in the world will be from 75 to 80 percent of the total production volume, and neat [chistoklinkernyy] cements will be considered as special-purpose binders.

The increase in the product mix of cements in EEC countries is connected specifically with an increase in the production of multicomponent cements. This allows conservation of fuel and energy resources on the one hand, but on the other hand it leads to certain difficulties in the distribution and use of these cements. Hence a countertrend arises toward simplifying the product mix of cements by removing excessive limitations on their physical composition.

For example, the draft European standard CE N 197-1 provides for the manufacture of six basic varieties of binders:

Portland cement, to which the introduction of up to five percent of active mineral additives or fillers is authorized;

Three varieties of portland cement with additives (slag, pozzolans, and mixed) with from a 10 to 35 percent content of active mineral additives;

Portland slag cement with a slag additive of from 36 to 80 percent;

Pozzolan cement with active additives (except for slag) of from 36 to 40 percent.

Up to five percent active additives can be replaced by additive-fillers in all these binders.

The draft standard provides for dividing cements into two classes based on strength: with activeness of at least 32.5 and 42.5 megapascals, with each of them divided into two subclasses: with normal setting and high-early-strength.

Thus the product mix of cements of the EEC countries contains 24 type-grades of general construction cements and can be additionally reduced by eight type-grades by uniting portland cements with additives in one type.

Practical experience of the cement industry of France and Spain was made the basis of the European draft standard.

\*(Dyutron), P. "The Present and Future of Cement Intended for Plant-Manufactured Concrete," report at the London International Concrete Congress, 1984.

Similar proposals also are contained in our draft standard in place of GOST 10178-76, submitted to USSR Gosstroy for approval, only with the exception that the introduction of mineral additives to portland cement is limited to 20 percent.

A contraction of the product mix of our cements by uniting plain portland cement and portland cement with mineral additives to five percent into a single type based on the experience of EEC countries, Japan and the GDR is the first and a necessary step in this direction.

In countries which have a practice of dividing cement by grades, the standards usually provide for from three to five grades of binder (the CEMA member countries, FRG, France and so on).

The USSR also provides for five grades of cement. Our actual proportion of high-grade cements, not to mention their absolute volume, is higher than in the majority of industrially developed countries (Table 2).

Table 2

Country (data for 1981)	Overall Cement Production, millions of tons per year	Assortment of cements produced in the USSR and selected CEMA and capitalist countries								
		By types, %						By grades, %		
		Portland Cement (PC)	Portland Cement with Additives (PCA)	High-Early Strength (HES)	Portland Slag Cement (PSL)	Pozzolan (Poz)	Other	Up to 300	400	500 and up
USSR <sup>1</sup>	124.0	18.5 <sup>2</sup>	45.2	6.9	25.6	3.4	0.4	14.5	64.7	20.6
GDR <sup>3</sup>	12.2	-	84.0	{PC PCA HES}	1%	1.0	-	16.0	70.0	14.0
CSSR	10.3	24.2	-	-	75.8	-	-	70.0	28.0	2.0
USA	76.0	90.4	-	{PSC Poz}	1.1	{PSC Poz}	5.2	-	90.0	10.0
Japan	84.8	91.2	-	1.4	5.2	2.0	0.2	No Data		
FRG	31.5	73.8 <sup>4</sup>	-	-	25.1	0.5	0.6	0.1	76.3	23.6
France	28.2	23.8 <sup>5</sup>	67.7 <sup>6</sup>	-	-	-	8.5	10.0	80.0	10.0
England	12.8	90.5 <sup>3</sup>	-	-	0.1	-	9.4	5.0	55.0	40.0
Italy	42.1	50.0	-	-	5.0	40.0	5.0	20.0	60.0	20.0

<sup>1</sup>All data quoted for 1982.

<sup>2</sup>Including special cements, such as for asbestos cement articles and so on.

<sup>3</sup>Information by types given for 1980.

<sup>4</sup>Data by types quoted for 1979. [This footnote does not appear on the table--Translator Note].

<sup>5</sup>Including high-early-strength cement.

Removal of excessive limitations on the physical composition of cements would allow, by analogy with the draft EEC standard, a reduction in the number of grades of binder to two or three, which would make it possible to significantly reduce the product mix of cement and lower its losses and overexpenditure from mixing and using cements of different types and grades for other than their purpose.

An improvement in the geographic distribution of cement is a very important factor in improving its assortment.

Production of high and low grades of cement is distributed especially unevenly. For example, with the proportion of production of grade 500 cement in the country averaging 20.6 percent of overall production in 1982, its share of output in the European area was 24.7 percent, it was 15.3 percent in the Urals and only 12.4 percent in the eastern areas of the production volume in the given regions.

An acute shortage of grade 500 cement is seen in Central Asia and the Transcaucasus. Enterprises of these areas need the assistance of sectorial institutes in mastering high grades of cements.

Another important task is to master the production of high grades of cement on large-capacity dry-method process lines. The experience of the Spasskstsement Production Association, which mastered production of a grade 500 binder, must be studied and generalized for this reason.

According to data of the NIIZhB [Scientific Research Institute of Concrete and Reinforced Concrete], overall production of grade 300 cement in the country is 4-5 million tons below the demand for it. Production of this binder is concentrated in 3-4 of the country's economic regions (in the South Urals, in the Donetsko-Pridneprovskiy region and so on), however, at plants which gravitate toward large metallurgical combines.

Grade 300 cements as well as cements for mortars are not being produced at all in a number of the country's regions (the Baltic, Northwest, Far East, and Belorussian SSR). For this reason high-grade cements are being used for low-grade concretes and mortars.

The way to solve this contradiction lies in an expansion in the product mix of cement additives, chiefly from local materials: TES [thermal electric power station] ashes, secondary raw materials, and fillers.

We should dwell especially on cement for mortars. USSR Gossnab presently is not placing requests for it based on the fact that consumers are rejecting this cement since it is often allocated in place of grade 400 portland cement. But the situation will change immediately if masonry cement is allocated separately based on the need for it.

The product mix of special cements produced by the sector is very broad. Compared with 1980, there has been an increase in the production of sulfate-resistant, oil-well, decorative, roadbuilding and other effective types of cement, many of which have been given the highest quality category.

It must be noted that the diversity of sulfate-resistant cements not only permits better support of construction needs, but also a conservation of thermal energy resources. This experience of ours is being adopted by foreign countries.

We place great emphasis on producing oil-well cements. A new standard for their classification has been approved at the present time and new GOST's on the methods of their testing and on specifications are being developed. But not all workers of cement enterprises have yet realized the special importance of improving the quality and assortment of oil-well cements.

The quality of roadbuilding cements was improved following the introduction of new specifications for them. A price markup has been established on this type of product for the first time in the sector.

But still the need for special cements is not yet being fully satisfied despite the steps which have been taken. An improvement in the geographical distribution of their production therefore is necessary.

The introduction in industry of new and improved types of cements obtained as a result of scientific research is of very great importance for the conservation of fuel and energy resources.

For example, the use of crystallization components ("krenty") developed by the State All-Union Scientific Research Institute of the Cement Industry and Yuzhgiprotsement [State All-Union Institute for the Planning of Cement Plants and for Scientific Research Work] in collaboration with other institutes permits expanding the output of high-strength cements on the basis of conventional technology and raising the quality of ordinary cements. But the introduction of crystallization components is being inadmissibly dragged out and the deadlines provided by the comprehensive program are being threatened with disruption, since a site for constructing a process line for production of this additive has not been determined once and for all and capital investments have not been allocated to this date.

The output of plastified cement with the LSTM-2 superplastifier is being expanded slowly even though there is a 7-15 percent saving of cement with its use.

The output of stressing [napryagayushchiy] cement, which helps obtain items with increased density, is up to 70,000 tons per year, while there is a need for up to 500,000 tons of it under a USSR Gosstroy request.

The Besalit extrahigh-early-strength cement, which in a number of cases permits the elimination of heat-moisture treatment of concrete, is being produced only at the rate of 1,000-2,000 tons per year, and its production engineering has not been completely worked out.

We should dwell in particular on prospects for introducing NTS [Scientific-Technical Council]-technology of cement. The most important problems which have not been completely resolved here continue to be assurance of production

of chlorine products and protection of industrial equipment and concrete reinforcing against corrosion.

The problem of NTS technology is one of the important ones in the sector. Therefore we must not conceal problems of the new direction which have not yet been resolved, but assure their rapid, quality solution.

Introduction of the results of scientific development and working the prototypes up to industrial technology are the principal ways to further improve the assortment and quality of cement.

But the institutes and authors of developments are not yet displaying the necessary determination in matters of their adoption. Cement industry enterprises, too, are unwilling to include new types of products in production plans and the main administrations and sectorial republic ministries are not supporting the priority allocation of resources for the introduction of new equipment.

There is a trend toward reducing the activeness of clinker at a number of enterprises under the pretext of a need to conserve fuel, but this is an erroneous practice. An analysis shows that specific fuel consumption for burning not only is not on the increase at those enterprises where the activeness of clinker is growing, but to the contrary, it is decreasing (Fig. 1). This is understandable, since an increase in clinker activeness can be achieved only based on an improvement in industrial discipline and high culture of production.

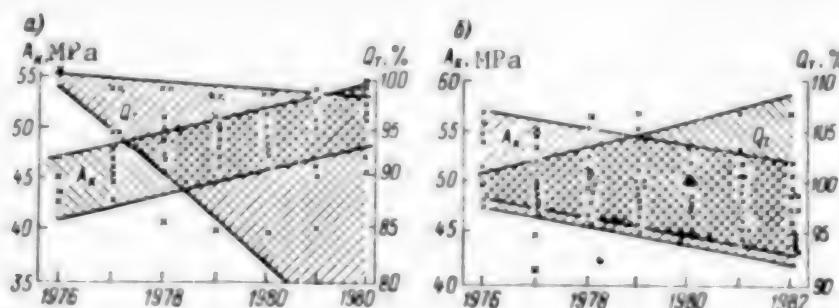


Fig. 1. Interrelationship of clinker activeness  $A_k$  with fuel consumption  $Q_t$  at cement enterprises by years with its increase (a) or decrease (b).

A drop in clinker activeness is especially intolerable because it makes it necessary to decrease the introduction of additives, which in turn leads to an even greater overconsumption of fuel (Fig. 2).

The very same can be said of the practice of some enterprises of not completely grinding the cement, which also leads to a reduction in the additives introduced to it, to incomplete use of the clinker's chemical activity and, as a result, to an increase in consumption of fuel and energy resources and an overexpenditure of cement in construction.

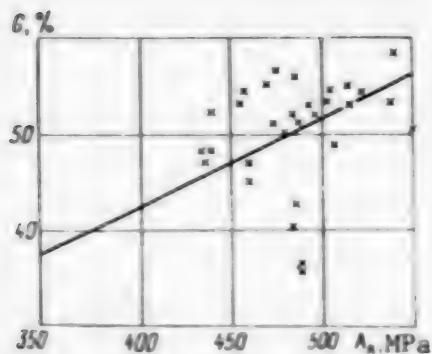


Fig. 2. Mean relationship of the introduction of additives  $G$  to clinker activity  $A_k$ , based on data of the Bezmein, Dneprodzerzhinsk, Savino, Magnitogorsk and Semipalatinsk plants ( $G=0.1 A_k=5$ ;  $\rho=0.69$ ).

There are deficiencies in guaranteeing the grade of cement being shipped. The proportion of cements with a five-percent tolerance and reduced quality at some enterprises exceeds that allowed by the standard, especially in producing grade 500 portland cement and grade 400 portland slag cement.

In order to regulate cement quality control, the USSR Gosstroy, the State Committee for Standards and the USSR Ministry of the Construction Materials Industry made the decision to establish a pilot organization for state cement testing (GOGITs) with base points. Responsibilities of the pilot organization have been placed on the State All-Union Scientific Research Institute of the Cement Industry, and responsibilities of base points have been placed on a number of institutes. A statute on the GOGITs has been prepared for approval and is being coordinated with the State Committee for Standards and USSR Gosstroy.

One would like the USSR Ministry of the Construction Materials Industry to show proper understanding for the work of the GOGITs, to allocate the necessary staff personnel for it and to provide daily assistance in its work. It is obviously advisable to set up a product quality control inspectorate under the ministry and concentrate within it the work of organizing departmental control at enterprises of the USSR Ministry of the Construction Materials Industry, examination of complaints about product quality, and the adoption of prompt steps in response to them.

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## CONSTRUCTION METHODS AND MATERIALS

### COSTLY INEFFICIENCIES NOTED IN CEMENT PRODUCTION, UTILIZATION

Moscow BYULETEN STROITELNOY TEKHNIKI in Russian No 6, Jun 85 pp 5-6

[Article: "Concerning Measures for Reducing the Irrational Expenditure and Loss of Cement in Construction"]

[Text] An examination of cement expenditures in construction by the USSR State Committee for Construction uncovered serious shortcomings in this matter. In 1984 construction ministries permitted cement overexpenditures of R1 million worth of construction/installation work above established norms. These included, the USSR Ministry of Construction, which overexpended cement by 8.2 percent, the Ministry of Construction in the Far East and Transbaykal Regions by 5.9 percent, the Ministry of Construction of Heavy Industry Enterprises by 5 percent, and the Ministry of Rural Construction by 2.8 percent.

At many construction sites and construction industry enterprises the work towards the greatest possible savings of cement is not organized, cases of violations of technical discipline of the norms and standards governing production of cement work are permitted, the overstatement of tempered strength of concrete is allowed, and there are losses of cement during storage and transport. Many losses are also due to imperfections in weighing and measuring equipment, wear and tear of concrete mixers and forms, and the production of defective concrete articles. At a number of construction industry enterprises, older series concrete structures are still being produced. These require greater cement expenditures. The use of excessive production norms for the expenditure of cement was also apparent.

On the basic factors contributing to the irrational expenditure of cement (up to 4 percent of the total amount expended) is the low quality of the crushed stone, sand-gravel mixes, and sand supplied for the needs of construction and used in the preparation of concrete and mortar. The USSR Ministry of Construction Materials, construction ministries and departments are inadequately implementing work to increase the quality of fillers produced for concrete and mortar. The output of high quality crushed stone and sand is being increased slowly.

Organizations of the RSFSR Council of Ministers, the UkSSR Council of Ministers, the BSSR Council of Ministers, and the KaSSR Council of Ministers did not ensure the fulfillment of organizational and technical measures directed at increasing the production of screened and dressed non-metallic construction materials supplied by river transport enterprises. The RSFSR Ministry of River Transport, the UkSSR Main Administration of the River Fleet, and the BSSR and KaSSR Main Administration of the River Fleet continue to

supply builders with low-quality sand-gravel mixtures and sand, which cause a significant overexpenditure of cement. They are not undertaking the tasks set before them to supply non-metallic construction materials in strict accordance with the standards starting in 1986.

Enterprises of the USSR Ministry of Construction Materials often supply builders with cement which has less strength than indicated on the factory certificate, is insufficiently active during steam treatment, and which makes a thicker than normal cement paste, in addition to having other deviations from the standards. This led to an overexpenditure of up to 1.3 percent of the total cement expenditure at those construction sites which were checked in 1984.

Construction ministries did not ensure the fulfillment of the tasks set before them to introduce in 1983-84 the capability to produce superplasticizers for concrete. Hence, superplasticizers--an important source of savings of cement--are used utterly insufficiently at present.

In the organizational and technical measures for decreasing irrational expenditures and losses of cement in 1985 and in the 12th Five-Year Plan which were submitted by the USSR construction ministries, they failed to fully consider existing means to save cement at construction sites and enterprises of the construction industry were not fully considered.

The USSR Ministry of Construction Materials is making inadequate provisions for measures to improve the work of cement plants, to increase the quality of cement produced, and to guarantee those of its characteristics which are set by standards.

On 19 March 1985 the Collegium of the USSR State Committee for Construction reviewed the results of an examination of the expenditure of cement in construction and defined measures for the elimination of its irrational use. It was determined that construction ministries and departments must:

--strengthen work on reducing irrational expenditures and losses of cement at construction sites and construction industry enterprises; use to the maximum extent all reserves and possibilities for saving cement; establish continuous control over the use of cement, not allowing its overexpenditure in the amount of one million rubles of construction installation work;

--elaborate existing production norms for the expenditure of cement during the manufacture of concrete and reinforced concrete articles, work out new norms where there are none, and establish control over the observance of the norms;

--take additional measures for increasing quality of fillers produced for concrete and mortar; organize where necessary the screening and washing of inert materials; in the near future significantly increase production of high quality non-metallic construction materials;

--work out the organizational and technological measures for decreasing the expenditure of cement in construction during the 12th Five-Year Plan in accordance with the established tasks.

--present to the USSR State Committee for Construction suggestions for saving cement for inclusion in the scientific technical program for the 12th Five Year Plan including, at the expense of working out new progressive structures, elaborating the normative documents, increasing the use of superplasticizers and other additives, introduction of systems of statistical control over concrete quality, and implementation of other measures.

Declarations by the USSR Ministry of Heavy Construction, the USSR Ministry of Rural Construction, the USSR Ministry of Construction, and the Ministry for Construction in the Far East and Transbaykal Regions have been taken into consideration. These additional measures to reduce irrational expenditures and losses of cement in construction and to speed up the construction and commissioning of installations for the production of superplasticizers for concrete.

Consideration has been given to the declaration of the USSR Ministry of Construction Materials that the ministry will work out, in short order, measures for increasing the quality of cement output, guaranteeing its conformity with the requirements, standards and factory certificates, and also measures to reduce losses of cement during its production and transport to consumers; and will adopt measures to guarantee production of cement in accordance with the tasks set forth in the 12th Five-Year Plan and to significantly increase output of high quality graded crushed rock and sand.

The Collegium of the USSR State Construction Committee requested the RSFSR Council of Ministers, the UkSSR Council of Ministers, the BSSR Council of Ministers and the KaSSR Council of Ministers to commit the RSFSR Ministry of the River Fleet, and the UkSSR, BSSR, KaSSR Main Administrations of the River Fleet to speed up the completion of the organizational and technical measures directed at increasing the capacity of equipment for grading and dressing extracted sand and gravel both on floating and shore-based installations, increasing the quality of these materials, ensuring their supply to construction organizations and enterprises of the construction industry in 1986 in accordance with the Statute Concerning the Supply of Products for Production and Technical Purposes.

The Main Technical Normative Administration, the Main Construction Scientific Administration, and the Scientific Research Institute of Reinforced Concrete are commissioned to present a draft change to GOST 13015.0-83 "Structures and Articles Made of Concrete and Prefabricated Reinforced Concrete Structures: General Technical Requirements" in connection with amplifying those sections of the GOST which deal with the procedures for rating the tempered strength of concrete.

The Collegium of the USSR State Committee for Construction has committed the Construction Materials Expenditure Normative Department, the Construction Industry and New Materials Department and the Main Technical Normative Administration to strengthen control over the work carried out by the construction ministries and departments toward the reduction of irrational expenditures and losses of cement at construction sites and construction industry enterprises and to broaden the verification of the observance of the production norms for the expenditure of cement in concrete work and in the production of structures and articles of marketable concrete and mortar. This is to be done with the participation of the interested administrative subdivisions of the committee, and design and scientific research institutes.

The Department of Scientific and Technical Information and Publications must organize the publication of materials about the campaign against cement losses in the industry press, and include in the theme of the 1986 USSR Exhibition of Economic Achievements a demonstration of the experience of the leading construction projects and enterprises in the rational expenditure of cement.

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## CONSTRUCTION METHODS AND MATERIALS

### CONSERVATION THROUGH MORE TARGETED USE OF CEMENT GRADES

Moscow EKONOMIKA STROITELSTVA in Russian No 8, Aug 85 pp 24-27

[Article by D. V. Zerkalov, candidate of technical sciences, and A. A. Lashkov, engineer, under the rubric "Economy of Construction Resources": "Effective Technical Solutions for Conserving Cement"]

[Text] There presently is a large number of various technical solutions providing for cement conservation which is included both in the intersectorial list as well as the sectorial lists of organizational and technical supply economy measures in construction.

Difficulties often arise in construction organizations in computing the amount of cement conservation when introducing various organizational and technical measures and industrial measures. There are various reasons for this. Some specialists are not familiar with the instruction on the procedure for compiling an account on supply economy in construction on Form No 10-SN, approved by USSR TsSU [Central Statistical Administration] Order No 526 dated 5 November 1979, other specialists lack sufficient experience, and so on. The authors have systematized cement conservation measures which have been most widespread in construction for the purpose of facilitating the work of construction organization specialists.

It must be recalled above all that all cement grades supplied by industry are equated to Grade 400 in determining the volume of savings. The formula  $\pm P = (400 - M)0.1$  is used to compute the correction [P] in percentage to the mean computed norm of cement consumption. Thus the effectiveness of all cement conservation measures is evaluated, in accordance with Form No 10-SN, in tons of Grade 400 cement per unit measure of assimilation volume.

The introduction of precast-slab foundations and piers without foundation pads, made of tubular pilings up to 3 m in diameter, as well as the introduction of foundations for large bridges made of vertical drilled-and-filled and drilled-and-cased columns up to 1.7 m in diameter with or without an enlarged base up to 3.5 m in diameter, in place of foundations made of massive caissons permits saving 375 tons of cement per 1,000 m<sup>3</sup> of tubular pilings and 1,000 m<sup>3</sup> of columns respectively;

Introduction of reinforced concrete tubular pilings 1.2 m in diameter with a wall 12 cm thick and 4-8 m long sunk by the undercutting method or by the vibratory pile-driving method, in place of knife-edge pile foundations saves 200 tons per 1,000 m<sup>3</sup> of piles;

Introduction of short pyramidal and knife-edge piles in place of long knife-edge and continuous foundations when building on subsiding soils saves 150 tons per 1,000 m<sup>3</sup> of piles;

Introduction of round reinforced concrete screw piles 0.7 and 0.9 m in diameter saves 150 tons per 1,000 m<sup>3</sup> of piles;

Introduction of reinforced concrete column piles for single-story framed industrial and agricultural buildings in place of ordinary driven piles and columns saves 110 tons per 1,000 m<sup>3</sup> of piles;

Introduction of columnar piers of reinforced concrete bridges with reinforced concrete collar beams in place of solid-type piers saved 100 tons per 1,000 m<sup>3</sup> of piles;

Introduction of reinforced concrete tubular piles in place of solid reinforced concrete piles saves 80 tons per 1,000 m<sup>2</sup> of piles;

Introduction of drilled-and-filled and pyramidal piles in place of knife-edge piles saves 80 tons per 1,000 m<sup>3</sup> of piles;

Introduction of columnar piers and foundations on soils preserved in a frozen state in place of piers with foundations built in pits saves 109 tons per 1,000 m<sup>3</sup> of concrete;

Introduction of sand drains in loose, water-saturated soils in place of reinforced concrete piles saves 70 tons per 1,000 m<sup>3</sup> of drains;

Introduction of columnar piers of highway bridges in place of solid-type piers saves 50 tons per 1,000 m<sup>3</sup> of concrete;

Introduction of catenary system piers 15.6 m long installed directly in pits for power supply of the BAM [Baikal-Amur Mainline] in place of piers 13.6 m long on foundations saves 230 tons per 1,000 piers;

Introduction of reinforced concrete tubular pilings 40 cm in diameter and 12 m long in place of piles with a cross-section of 35x35 cm saves 64 tons per 1,000 m<sup>3</sup> of piles; and use of the same kind 20 m long saves 33 tons per 1,000 m<sup>3</sup>;

Introduction of pile foundations without foundation mats in place of foundations with a low foundation mat saves 45 tons per 1,000 m<sup>3</sup> of piles;

Introduction of precast-slab foundations made of standardized perforated blocks from 0.6 to 6 m long with 40x40 cm perforations (with 40 percent hollowness) with sand filling and a partial slab in place of solid-type foundations saves 45 tons per 1,000 m<sup>3</sup> of perforated blocks;

Introduction of ZF-1 foundations of the catenary system piers in place of casting foundation piles 6 m long saves 35 tons per 1,000 foundations;

Introduction of foundationless structures for the installation of ORU-220 kw traction substations in place of slab foundations saves 21.4 tons per substation;

Introduction of triple-beam foundations and anchors of the catenary system in place of DS-DA reinforced concrete I-beam foundations saves 106 tons per 1,000 m<sup>3</sup> of structures.

The use of continuous web-plate highway bridge spans of 33-63 m in place of spans based on individual designs and continuous spans made of standard blocks reduces cement consumption by 60 tons per 1,000 m<sup>3</sup> of spans; use of individual structures of overpasses and urban trestles in spans of up to 48 m in place of individual solutions from standard beams saves 55 tons; use of continuous highway spans made of prestressed reinforced concrete web-plate structure in spans of from 33 to 42 m in place of continuous and temperature-continuous spans from standard beams saves 50 tons; use of continuous 42-m highway spans which are sectional in length assembled by cantilever erection and longitudinal protrusion in place of the girder-frame-suspension assembly of systems saves 380 tons; and the use of temperature-continuous and continuous structures of overpasses, trestles and highway bridges made of standard beams and plates in place of continuous structures based on standard plans saves 11 tons per 1,000 m<sup>3</sup> of spans;

Use of arched overpasses on Category I highways over field roads and Category V roads in place of triple-span overpasses (with spans of 12 m each) saves 22 tons per overpass;

Use of precast railroad deck bridge piers made of enlarged reinforced concrete blocks for spans up to 33 m long in place of solid-type piers made of cast-in-situ concrete saves 123 tons per 1,000 m<sup>3</sup> of concrete;

Use of a reinforced concrete frame in place of a column-beam frame for agricultural buildings saves 85 tons per 1,000 m<sup>3</sup> of concrete;

Use of prestressed trussed [stropilnyye] and of subrafter [podstropilnyye] beams 18 m long (Grade 600 concrete) with bent strand [pryadevyy] reinforcement and a change of beam cross-section by the formation of a lower arched recess in place of Series 1-462-1 beams saves 160 tons per 1,000 m<sup>3</sup> of structures; and the very same 12 m long saves 110 tons;

Use of prestressed reinforced concrete lattice beams with a span of 12-18 m in place of standard series PK-01-06 beams saves 75 tons; multicavity interapartment partition panels in place of solid single-layer structures saves 100 tons; prestressed V-shaped reinforced concrete folding panels [panel-skladka] for industrial buildings in place of planar components saves 140 tons; circular reinforced concrete columns in the construction of production buildings and engineering facilities in place of similar rectangular columns saves 120 tons; 3x12 m reinforced concrete paving slabs with ribs of varying height and with the bent strand reinforcement in place of slabs with traditional reinforcement saves 70 tons; prestressed multicavity reinforced concrete flooring made of Grade 200 concrete reinforced by high-strength wire with additional anchor heads in place of slabs made of Grade 300 concrete with rod reinforcement provides a saving of cement amounting to 80 tons per 1,000 m<sup>3</sup> of flooring.

The introduction of Series 1-232-3 three-layer suspended asbestos cement panels with an effective insulation in place of claydite-concrete panels saves 55 tons of cement per 1,000 m<sup>2</sup> of panels; light-concrete three-layer external wall panels with effective insulation and stiffening joints [zhestkiye svyazi] for residential buildings in place of single-layer claydite-concrete panels saves 35 tons; reinforced cement panels for suspended ceiling construction (Type AU-69-24-11) saves 65 tons; a decrease in thickness of single-layer enclosure panels made of light and cellular concretes resulting from a decrease in volumetric mass of concrete saves 30 tons; use of external wall panels made of claydite-concrete (cement consumption drops because of a 20 percent decrease in wall thickness) saves 40 tons; use of light foamed [porizovanny] concretes for safety structures, allowing a reduction in the thickness of enclosures, saves 30 tons; insulated roof panels made of claydite-perlite concrete in place of structures made of heavy concrete with an insulation fill saves 20 tons per 1,000 m<sup>2</sup> of panels; large gypsum concrete partition panels in place of brickwork with cement mortar saves four tons per 1,000 m<sup>2</sup>; integrated structures of light concrete in large-panel and prefabricated modular unit house building in place of structures of heavy concrete saves 20 tons per 1,000 m<sup>3</sup> of structures; plaster board [gipsokartonnyy] sheets of improved quality in place of finishing with sand and cement mortar saves five tons per 1,000 m<sup>2</sup> of covered area; and use of plaster board sheets of improved quality for making partitions in place of brick partitions saves 13.4 tons per 1,000 m<sup>2</sup>.

The introduction of technical solutions of gravity berths on large-diameter (10.4 m and 10.7 m) precast, reinforced-concrete casings in place of berths made of massive concrete weighing up to 100 tons permits saving 1,820 tons of cement per 1,000 m<sup>3</sup> of casings; transport buildings of increased plant readiness made of light metal structures delivered in sets in place of buildings with brick walls of precast reinforced concrete structures saves 60 tons per 1,000 m<sup>2</sup> of production area; slab solutions for residential and public buildings in place of frame and frame-panel buildings saves 80 tons per 1,000 m<sup>2</sup> of total area; self-bearing slag-cotton heat-insulating cover slabs laid directly on spans in combination with corrugated asbestos cement roofing sheets in place of the usual solutions using reinforced concrete slabs saves 24 tons per 1,000 m<sup>2</sup> of cover; and making precast cover in place of cement-soil covering saves 11 tons per 1,000 m<sup>2</sup>.

Cement consumption can be lowered by 10 percent by reducing the amount of delivered [otpusknaya] strength of articles with consideration of the time periods for placing loads on structures, organization of container shipment, assurance of a brief period of container storage of cement, use of frost-resistant aggregates (including claydite for concrete under conditions of the North and Far North), and manufacture of reinforced concrete structures by the shock method.

An eight percent saving on cement is provided by multipurpose additives to concrete consisting of 0.15-3 percent SDB (sulfate-yeast mash) and 0.5-1.5 percent calcium nitrate or ammonium nitrate, the use of cements with plasticifying additives, use of scouring sand for the preparation of concretes, reducing the thickness of the brickwork joints (with permissible negative tolerances as against design tolerances), and washing the crushed stone and gravel intended for making reinforced concrete structures and articles.

Seven percent of the cement can be saved by adding NNKhK [exact expansion unknown] to concretes, by using additives which increase the activity of cement in preparing concrete and which speed up its hardening (sodium sulfate, calcium chloride), and by using additives of organosilicon compounds for improving the properties of concrete.

Taking account of the actual activity of cement in preparing and choosing the composition of concrete for making reinforced concrete structures and articles, using optimum mixtures of concretes and mortars, making the optimum selection of the composition of concrete aggregates by fractions with consideration of maximum permissible coarseness of the crushed rock or gravel being used, making conditioned sand from local fine sand by adding to it 20-50 percent coarse quartz sand or granite or rock screenings of granulated slag, fractionation of aggregates intended for making concrete and reinforced concrete structures and articles, increasing the volume of cement shipments by cement trucks instead of open vehicles, mechanized unloading of cement from rail cars, and increasing laboratory control over the prompt selection of the composition of concretes (using an accelerated testing of cement) with consideration of the actual activity of delivered cement reduces cement consumption by five percent.

The use of pneumatic conveyance of cement and devices allowing for weighing rail cars, and the receipt of cement with weighing and a control inspection of its grades provides a three-percent saving of cement; installation of instruments for cumulative registration of cement weighed out by dispensers in preparing concretes and mortars saves two percent; and automation of BSU [exact expansion "unknown] with the use of UTsk [exact expansion unknown] and UPD [exact expansion unknown] dial indicators saves one percent.

The centralized preparation of concretes and mortars at specialized plants (in place of construction centers) permits reducing cement consumption by ten tons per 1,000 m<sup>3</sup> of mixture; delivery of plant-prepared concretes and mortars to the construction site in concrete trucks or mobile dry-mixture mixers saves 15 tons; the transport of concretes and mortars by specially equipped dump trucks saves 10 tons; careful laboratory and production control over transport times of concretes and mortars to preclude delays reducing the layability of mixtures saves 20 tons; introduction of a system for dispatching concrete to projects according to limits in conformity with the plan and calculations of required volumes under progressive production norms saves 10 tons; and the use of aggregates of hard rock in making slab structures saves 20 tons.

Twenty tons per 1,000 m<sup>3</sup> of concrete can be saved by using improved methods of electric heating of the concrete mixture in winter; obtaining stiff concrete mixtures in positive-action mixers and compacting them by powerful means of mechanization such as needle vibrators, high-quality pneumatic vibrators and so on saves 40 tons; using plastifying additives together with hardening accelerators (sulfite-alcohol and sulfite-yeast mash) saves 30 tons; introducing air entrainment additives to concretes and mortars such as aluminum powder with potash saves 35 tons; using dispersed fly ash of TES in the production of cluster articles made of heavy concrete of grades 150-300 with the addition of 120-200 kg of them per one cubic meter of mixture saves 90 tons; the addition

of inert lime in the composition of a porous concrete mixture for saving portland cement saves 60 tons; and the use of a jarring machine for formless casting of pilings, gutters and other articles made of stiff concrete mixtures saves 25 tons.

The use of large gypsum concrete partitions in place of brick partitions permits saving four tons of cement per 1,000 m<sup>3</sup> of partitions; use of a noncement preparation for floors and other structures saves five tons per 1,000 m<sup>2</sup> of bracing [styazhka]; use of a polyvinyl chloride waterproofing compound for insulating reservoirs and other facilities saves five tons per 1,000 m<sup>2</sup>; and use of cement bracings in place of asphalt concrete bracings saves six tons per 1,000 m<sup>2</sup>.

Forty tons of cement per 1,000 m<sup>3</sup> of mixture can be saved by replacing a portion of the cement in concretes and mortars with lime-ash and other locally available binders (including for autoclave-cured concretes); the use of lime in preparing masonry and plaster solutions saves 80 tons; use of cement kiln dust in concretes and mortars saves 50 tons; preparation of light concretes based on high-grade gypsum-cement-pozzolan binder in place of a purely cement binder saves 150 tons; and use of light and heavy concretes based on binders from finely ground blast-furnace slags and alkaline solutions for hardening in place of cement saves 60 tons per 1,000 m<sup>3</sup> of mixture.

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## CONSTRUCTION METHODS AND MATERIALS

### CONSTRUCTION MATERIALS PLANTS SET GOALS FOR 12th FIVE-YEAR PLAN

Moscow STROITELNNYE MATERIALY in Russian No 9, Sep 85 pp 2-3, 30

Article: "Initiative of Collectives of Production Associations and Enterprises of the Branch in Raising Production Efficiency and Volumes During the 12th Five-Year Plan Based Upon the Accelerated Introduction of the Achievements of Scientific-Technical Progress"/

Text/ A decree of the Board of the USSR Minstroymaterialov /Ministry of the Construction Materials Industry/ and the Presidium of the Trade Union Central Committee has approved the initiative of the collective of the Borskiy Glass Plant imeni M. Gorkiy which, following the example of the Volzhsk AvtoVAZ Association, undertook socialist obligations aimed at achieving higher indicators in accelerating scientific-technical progress, raising the production efficiency and volumes compared to the control figures assigned to the plant for the 12th Five-Year Plan and also for successfully completing the 11th Five-Year Plan and worthily preparing for the 27th CPSU Congress. The workers attached to the Borskiy Glass Plant imeni M. Gorkiy requested that these socialist obligations be included in the state plan for the enterprise for 1986 and the 12th Five-Year Plan and they called upon workers in the construction materials industry to mark the arrival of the 27th CPSU Congress with labor accomplishments and to do everything required of them in the interest of raising the branch to a new technical level.

The labor collectives of the branch's leading enterprises, following the initiative of workers attached to the AvtoVAZ Association and in response to the appeal by the Borskiy glass workers, adopted socialist obligations aimed at achieving higher goals during the 12th Five-Year Plan than those set forth in the control figures, based upon an improvement in the technical level of production and the introduction of leading experience and modern scientific-technical achievements. Moreover, the plans call for a majority of measures to be carried out by means of modernization and the technical re-equipping of production.

Thus, for the 12th Five-Year Plan the collective of the Nevyansk Cement Plant resolved to carry out technical re-equipping with the installation of a highly

productive technological line for the dry production method, with a daily capability of 3,000 tons of clinker, a domestic decarbonizer and cyclone heat exchangers. In addition, it plans to master the production of cement using the new technology and to achieve the planned indicators for this line by 1990, organize the production of colored cements at the plant based upon the use of raw materials and a modern technology and to master the production of decorative cements in the volume of 50,000 tons. The plans call for the production of marketable products to be increased twofold compared to the figures for 1985, for labor productivity to be raised by 19 percent above the control figures established for the 12th Five-Year Plan and for profits to be increased by 2.4 million rubles. As a result of further improvements in the system for controlling output quality, to master the production of Portland cement, including Mark 500 and to produce it in the volume of 100 tons. Based upon the introduction of the new technology, to lower the specific norm for fuel consumption for the roasting of clinker by a half compared to the 1985 level.

Manual workers, engineering and technical personnel and office workers attached to the Gornozavodsk Cement Plant made provision in their adopted socialist obligations for using the capital investments allocated to the plant for the 12th Five-Year Plan for the modernization and technical re-equipping of production. To achieve the planned capability of the equipment by 1988 and to produce 100,000 tons of cement over and above the established capability prior to the end of the 12th Five-Year Plan. The plans for the five-year period call for the production of marketable products to exceed the control figures by 5.3 percent, for labor productivity to be raised by 13 percent and for production costs to be lowered by 1.7 percent. In the absence of any requirement for additional resources, the plans for the next five-year plan also call for the production of 7 million rubles worth of products in excess of the assigned control figures and for 2.5 million rubles worth of profit to be realized.

Workers at the Savinskiy Plant for Asbestos-Cement Products have vowed, on the basis of efficient use of their production areas and the installation of new modernized lines, to increase the production volume for slate during the 1986-1990 period by 70 million standard slabs compared to the control figures for the 12th Five-Year Plan, thus ensuring the production of 5 million additional rubles worth of marketable products during the five-year period. The entire increase in the production volume will be achieved with no increase in the number of industrial-production personnel. The capital investments allocated to the plant must be used completely for raising the technical level of production and the quality of the products being produced. To master the production of new and effective structural corrugated asbestos-cement sheets for industrial and agricultural construction and by 1990 to raise the proportion of slate of the highest quality category to 50 percent of the overall volume of marketable products produced. Through the introduction into production of a resource-conserving technology, to reduce the consumption of raw materials and to lower material expenditures by 350,000 rubles during the five-year period. To achieve a reduction in product losses during transport operations, while increasing the volume of slate deliveries to consumers in packaged form by a factor of 1.5 by 1990 and raising it to 75 percent. To lower the consumption norms and to realize savings during the five-year period of 300,000 kilowatt hours of electric and 1,000 gigacalories of thermal power. Compared to the control figures, to obtain additional profit in the amount of 800,000 rubles.

The collective of the Moscow Order of the Red Banner of Labor Foundry Pig Iron Plant imeni Voykov resolved, based upon the use of a progressive technology, to master ahead of schedule the production capabilities for producing steel heating instruments of the "Komfort" and "Universal" types, to produce additionally during the 12th Five-Year Plan 100,000 EKM [equivalent square meters] of heating instruments, to increase the production of progressive steel heating instruments by twofold and to produce 500,000 rubles worth of marketable products in excess of the control figures. The production of the mentioned products, based upon a savings in material and energy resources, will produce additional profit in the amount of 250,000 rubles. To master a new waste-free energy-conserving technology for the production of radiator nipples. To install 26 units of automatic equipment, robot equipment and manipulators. To raise labor productivity by 25 instead of 20 percent, as called for in the control figures, and in this manner to achieve the entire increase in production volume.

Manual workers, engineering and technical personnel and office workers of the Tulasantekhnika Production Association, in the socialist obligations undertaken for the 12th Five-Year Plan, have called for the continuous redesigning of production operations at two of the association's plants, the introduction into production of 12 new products and the modernization of 10 others and the introduction of nine semi-automatic and automatic lines and 230 units of new equipment, including 80 units of specialized equipment, 15 robots and manipulators and 28 new resource-conserving technological processes. This will make it possible to reduce the labor-intensiveness by 1.2 million norm-hours, lower the production costs for marketable products by 1.5 million rubles and over-fulfill the control task of the five-year plan for rates of growth in overall production volume by 3 percent. The plans call for labor productivity to be raised by 26 percent during the five-year period, compared to a task of 21 percent in accordance with the control figures, with the entire increase in the production volume being achieved by means of growth in labor productivity. Based upon improvements in the all-round system for controlling the quality of output and labor, the proportion of goods bearing the state Badge of Quality must be raised to not less than 40 percent of the overall volume of products.

In their socialist obligations for the five-year period, the workers at the Karaganda Order of the Red Banner of Labor Heating Equipment Plant imeni 50-Letiya SSSR have undertaken to renew and modernize all of the products being produced. To raise labor productivity by 25.6 percent through the technical re-equipping of the principal departments and production sections, the introduction of 21 automatic lines, including 12 robot lines, the release of 70 workers from having to carry out heavy manual operations and the development of progressive brigade forms of labor organization. During the five-year period, to increase the production of marketable products by 16 million rubles worth over and above the control figures. During the 1986-1990 period, to carry out operations based upon the use of material and fuel-energy resources which were saved. To produce consumer goods in 1990 -- non-rusting kitchen sinks -- more than in 1985 by a factor of 10. To raise the proportion of products bearing the state Badge of Quality by a factor of five compared to the 1985 level.

For the 12th Five-Year Plan, the collective of the Volgograd Ceramics Plant has resolved to use all of the capital investments allocated for the technical

re-equipping and modernization of production. In the socialist obligations, the plans call for the production of sanitary ceramics products to be converted over from manually operated benches to a production line-conveyer technology, with the introduction of mechanized complexes. This will make it possible to renew completely the assortment for the production of products of modern forms and improved structures and also to lower labor-intensiveness. To install and master a new technological line involving the use of micro-processor equipment for the production of ceramic tiles of improved quality. To increase the production of decorator tiles for the interior lining of walls by twofold and floor tiles by threefold, to expand the consumer goods production section and to ensure an increase in the production of such goods. To renew completely the assortment of consumer goods being produced, to master more than 50 new types of products and to increase by a factor of 1.6 the production of products bearing the index "H." To ensure an increase by a factor of 1.5 in the proportion of products bearing the state Badge of Quality. Through the use of a resource-conserving and waste-free production technology and a reduction in technological losses, to reduce specific fuel consumption by 5.6 percent compared to the 1985 level, electric power by 1.8 percent and expenditures per ruble of marketable output by 2.5 percent, to increase profits by 15 percent, to carry out organizational-technical measures concerned with the certification and simplification of working positions, to achieve a reduction of 34 in the number of working positions and to release more than 100 workers.

Manual workers, engineering-technical personnel and office workers at the Leningrad Polimerstroymaterialy Plant resolved to produce, in behalf of the 12th Five-Year Plan, 1 million rubles worth of marketable products in excess of the control figures established for the plant, including 0.5 million rubles worth of consumer goods. The socialist obligations called for the development and mastering of the production of new and more efficient types of products. By the end of the five-year plan, to raise the proportion of products bearing the state Badge of Quality to 42 percent of the overall volume of marketable products. Using measures aimed at reducing the consumption of material and power engineering resources and introducing an energy-conserving technology and an ASU (automatic control system), to achieve savings as follows during the five-year plan (compared to the established norms): 0.5 million rubles worth of raw materials and other materials, 750 kilowatt hours of electric power, 5,590 gigacalories of thermal energy and 700 tons of conventional fuel.

Workers at the Krasnodar Construction Materials Combine No 1, in their socialist obligations, called for the technical re-equipping of the principal and auxiliary production efforts, an increase by a factor of 2.3 in the production of soft roofing during the 1986-1990 period and increases in the control figures of the five-year plan for the production of asbestos cement pipe of 100 standard kilometers and in soft roofing of 10 million square meters. The plans also call for an increase by a factor of 2.5 in the production of built-up roofing felt and the organization during the 12th Five-Year Plan of the production of asbestos cement products using the extrusion method. To master the production of a new type of roofing felt with a built-up layer of 2 kilograms or more and to increase the production of this product to 15 million square meters by the end of the five-year plan. To increase by twofold the production of asbestos cement pipe of the highest quality category and to raise it to 35 percent of the overall production volume for this product. To

mechanize the warehousing and shipping processes for soft roofing materials, with use being made of packets, and to eliminate manual labor completely in the carrying out of these operations. Through the introduction of energy-conserving technology and an ASU in energy-intensive processes, to lower the consumption norms and to save 0.65 million kilowatt hours of electric and 3,500 gigacalories of thermal power, thus exceeding the control tasks. To obtain 1 million additional rubles of profit compared to the assigned task.

In the socialist obligations undertaken by the labor collectives, specific tasks have been set forth for successfully carrying out the state plan for 1985 and the tasks for the 11th Five-Year Plan on the whole and also for worthily preparing for the 27th CPSU Congress.

In their socialist obligations, the workers attached to the branch's enterprises and organizations have also outlined measures for the social development of the labor collectives, for improving work organization and for strengthening labor and production discipline.

The labor collectives requested that their socialist obligations be included in the state plan for their enterprises for 1986 and for the 12th Five-Year Plan. They called upon the manual workers, engineering and technical personnel and office workers of other production associations and enterprises throughout the branch to analyze in detail the control figures provided for the 12th Five-Year Plan and to follow their example, having adopted socialist obligations aimed at raising the efficiency and volumes of production during the 1986-1990 period based upon the accelerated introduction of the achievements of scientific-technical progress.

The board of the ministry and the presidium of the trade union's central committee have approved the initiative of the collectives of those enterprises which adopted socialist obligations aimed at achieving higher indicators in accelerating scientific-technical progress and raising the efficiency and volumes of production, compared to the control figures assigned to their enterprises for the 12th Five-Year Plan, and also for the successful carrying out of the 1985 plan and the tasks for the 11th Five-Year Plan on the whole.

The adopted decree calls for the following: the carrying out in the labor collectives of the organizational work required for the extensive spread of the initiative displayed by the collectives of leading enterprises throughout the branch, in connection with raising the efficiency and volumes of production based upon an acceleration of scientific-technical progress and achieving higher goals during the 12th Five-Year Plan compared to the assigned control figures; launch on an extensive scale a socialist competition among the labor collectives for the successful fulfillment of the 1985 plan and the tasks of the 11th Five-Year Plan and for worthily preparing for the 27th CPSU Congress. To concentrate the attention of the competitors on achieving practical solutions for the tasks concerned with raising production efficiency and the quality of work, making maximum use of internal reserves, achieving high results with minimal expenditures, raising labor productivity and ensuring the thrifty consumption of raw materials, other materials and fuel and energy resources. Important concerns in organizing the socialist competition include: the extensive dissemination of leading experience, the accelerated introduction of new equipment, raising the level of organizational ability and responsibility for the carrying out of planned tasks and socialist obligations and further strengthening production and labor discipline.

**ECONOMIC ADVANTAGES OF MODULAR BUILDING CONSTRUCTION**

Moscow EKONOMICHESKAYA GAZETA in Russian No 16, Apr 85 p 15

/Article by B. Minkin, chief engineer at Architectural and Planning Shop No 9 of the TsNIEP [Central Scientific Research and Planning Institute for The Standard and Experimental Planning of Housing] for Housing, A. Vaynerman, senior scientific associate at the same central scientific research institute, and R. Popov, candidate of economic sciences: "Building Construction: Paths for Intensification"/

/Text/ Many things have been done in recent years to raise the industrial level of production for the construction industry. A network has been established in Krasnodar Kray consisting of plants producing prefabricated reinforced concrete and construction materials and elements, of enterprises and shops for large module, large panel and prefabricated room unit building construction, and of large rural construction combines.

The creation of construction industry plants has certainly improved the construction industry's funding and energy-equipped labor ratio of the construction industry and should sharply reduce periods of time required to complete construction projects while simultaneously increasing the amount of work that can be carried out.

But here is a paradox: In the kray's leading construction organizations --Glavkrasnodarpromstroy and Glavsochispetsstroy--during the past ten years, fixed production capital grew 1.5 fold but the volume of completed construction and installation work decline. Construction time for about a third of residential and civil construction work exceeds the norms. This suggests a need to introduce basic changes in the structure of the fixed production capital of contracting organizations and to make qualitative changes in the technology of construction and plant production. What path should be followed?

**The Effect of the Prefabricated Room Unit Method**

In our view, one promising direction is the development of prefabricated room unit building construction. This method of putting up residential and civil buildings was developed in Krasnodar Kray back in 1961 (the so-called Krasnodar technical trend).

The essence of this method lies in first manufacturing modular units of the "lying vessel" type (three interior walls, floor and ceiling) and then attaching exterior wall panels to them. The technology envisages full plant finishing of the module rooms. Only installation is accomplished at the construction site. This sharply improves the labor conditions of the construction worker while increasing labor productivity and the quality of construction projects.

Practice shows that, despite a 10-15 percent increase in relative expenditures of cement, use of the prefabricated room unit method of building residential and civil buildings ensures generally better economic and production indicators in comparison with large panel building construction. Moreover, the time needed to put up a building by the prefabricated room unit method is one half that in large panel construction and one third that in brick construction. Total labor expenditures are reduced to 5/6-5/8 of those using the other methods and requirements for labor resources at the construction site are reduced to 2/5-2/7.

In practical terms, with expenditures equal to other construction methods for one square meter of total area, prefabricated room unit construction ensures faster rates for raising buildings and also reduced manpower requirements at the construction site.

Of no small importance is the circumstance that the time needed to train a specialist for work on a finishing line in a plant is from one half to one third that needed for plasterers and painters at a construction site. At a plant there is also every possibility for fully mechanizing finishing operations and improving their quality.

Apartment buildings with a total area of more than a million and a half square meters have been built in Krasnodar Kray using the prefabricated room unit method. In Krasnodar itself, 82,000 square meters of prefabricated room unit and 50,000 square meters of prefabricated panel apartment houses opened for use during 1984 alone. The annual economic effect amounted to 900,000 rubles.

The labor of almost 500 building workers was saved in construction.

Activation this year of the second line at the Krasnodar prefabricated room unit construction plant and the increase in plant capacity to 206,000 square meters annually will produce an effect of up to 2,300,000 rubles and will make it possible to save the labor of 1,200 construction workers.

Construction of farmstead type homes as well as two- and three- story rural apartment buildings using prefabricated rooms has also been widespread widespread in the kray. This method of construction proved particularly valuable when creating rural settlements in new places and also where there are no construction workers with suitable qualifications, inasmuch as almost all work, including finishing, is accomplished at the plant.

This progressive method is being used actively by the Kraykolkhozstroyobyedineniye rural construction combine in Gulkevichi, which has constructed more than 200,000 square meters of well-made and comfortable homes at stations and farmsteads during the past decade.

We have amassed some experience in using the prefabricated room unit method for civil construction. In Krasnodar, a five-story hospital building was constructed of prefabricated room units in a total of five months. In Anapa, a dormitory building for the Prometey pioneer camp was built by the same method and in Sochi the Stavropolye boarding school is under construction also using prefabricated room units. Preparations are underway in several places for the construction of similar buildings.

The timely building of stores, pharmacies, personal service enterprises and other institutions is important in solving problems connected with over-all construction of residential regions and population points. With prefabricated room unit construction it is technically feasible to situate them in appropriate spaces on the first floors of apartment buildings. In this case, the first floor is prefabricated using pilings, beams and panels, as is done in large panel building construction, and the upper floors are constructed of prefabricated room units. The experience of building children's preschool institutions from prefabricated room units in the city of Pechora is of particular interest.

Introduction of prefabricated room unit construction in regions of high seismic activity, besides ensuring greater safety, makes it possible to reduce expenditures of steel by more than 10 percent in comparison with large panel construction. An important advantage of this progressive method of putting up buildings is also that it makes possible a considerable increase in the volume of residential and civil construction with a relatively small increase in labor resources. In this case, the basic part of the workers will be employed at plants producing construction elements for the prefabricated room unit buildings.

#### Where are the Reserves?

It must be said that existing technology and design solutions in prefabricated room unit building construction still possess rather significant reserves from the viewpoint of cutting expenditures of metal and cement, limiting plant labor costs and reducing total construction expenses. The finishing line continues to remain the least mechanized and most labor consuming process at plants at the present time. Calculations show that use of appropriate manipulators and, as a next step, robotization of finishing operations would make it possible to reduce the number of plant workers by 20-30 percent.

The main reason for higher expenditure of cement in the prefabricated room unit method as compared to large panel construction is the necessity of giving greater plasticity to the concrete mixture. Use of "floating" sides in molding machines in order to improve the setting of cement and also the use of super-plasticizers would allow a reduction in cement expenditures of 15-25 percent.

Unfortunately there are not yet any specialized plants for producing molding equipment for prefabricated room unit building construction plants. The equipment is still being manufactured on an individual order basis which, of course, is reflected in its price. This is also the reason for higher (by 18 percent compared to large panel construction) specific capital investments.

The creation of specialized plants for manufacture of equipment for prefabricated room unit building construction will make it possible (on account of series production) to reduce its cost by 20-30 percent and, as a consequence, also to cut construction costs. Solution of this problem will allow reduced expenditures for construction of prefabricated room unit apartment houses by 10-15 percent and will make it possible to reduce the labor-intensiveness of construction as a whole by 25-30 percent.

Under conditions of a diminishing flow of labor resources into the branch, we consider it necessary to make broader use of the prefabricated room unit method of putting up residential and civil buildings, a method which ensures savings in working hands, especially at the construction site. With these aims, the Minstroydormash /Ministry of Construction, Road, and Municipal Machine Building/ and the Giprostromash /All-Union State Planning and Design Institute for the Planning of Construction Industry Installations/ should accelerate the development and arrange for the production of specialized robots or sets of equipment for performing finishing operations on prefabricated room units under plant conditions. The NIIZhB (not further identified) of the USSR State Committee for Construction needs to develop plasticizers for ceramic concrete and technology for their use in prefabricated room unit building construction. It is also necessary to introduce certain corrections in price formation and the system of accounting for prefabricated room unit construction. We think that the construction ministries should also take a constructive position in this matter.

Everyday, prefabricated room unit building construction finds an increasingly large number of supporters. However, to ensure its necessary development, more energetic efforts are also needed on the part of those responsible for ensuring scientific and technical and economic progress in construction.

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## CONSTRUCTION METHODS AND MATERIALS

### HUGE SECONDARY SOURCE OF BASE MATERIALS LEFT UNTAPPED

Moscow MOSKOVSKAYA PRAVDA in Russian 29 Aug 85 p 2

[Article by Hero of Socialist Labor N. Zhavoronkov, academician and academician secretary of the Physical Chemistry and Technology of Inorganic Materials Department of the USSR Academy of Sciences, and Professor L. Sorin, science correspondent of MOSKOVSKAYA PRAVDA: "Scientific and Technical Progress: Problems and Prospects; Billions in Slagheaps Wasted by Lack of Interdepartmental Coordination"; passages rendered in all capital letters printed in boldface in source]

[Text] Everyone will admit that our planet's mineral riches are colossal but not unlimited. The intelligent and maximally careful use of natural resources is a dictate of the times. The time has come for the comprehensive processing of crude minerals for the derivation of all useful elements.

It is characteristic of present-day physical production that the conversion of mineral resources into commercial products--for example, aluminum, soda, potash or cement--necessitates an entire series of separate production processes, accompanied by the appearance of waste, so-called "tailings," which can then serve as an adequate secondary resource.

Modern chemical technology can minimize the "tailings" or waste: It provides for their utilization, for the inclusion of waste and by-product production and consumption processes in the total production cycle and, finally, for the elimination of air and water pollutants.

High-quality bauxite, the world supply of which will be depleted in the first quarter of the 21st century, is still the main raw material used in aluminum production. Therefore, the increased production of aluminum would be unthinkable without the expansion of its raw material base through the inclusion of other natural resources--for example, inferior grades of bauxite, nepheline, alunite, coalite clay and the mineral fragments in coal, the supplies of which are, fortunately, virtually unlimited.

Natural nepheline, the most widely available mineral with an aluminum content, should be given priority among all of the various raw materials in aluminum production. Nepheline is a by-product of apatite-nepheline rock. This is precisely why it is one of the "tailings" in the production of apatite concentrate.

In other words, the excavator scoop contains apatite-nepheline ore, from which apatite concentrate is then produced--this is the main purpose of the ore extraction process. The concentrate is then used in phosphorus fertilizer production. The rest of the apatite-containing rock is dumped because it is of little interest, oddly enough, to phosphorus fertilizer producers. This is an example of the inefficient, strictly departmental approach to statewide problems and the needs of the national economy.

Some 35 years ago, scientists and specialists from several institutes in Moscow and other places, who were later awarded the Lenin Prize, developed a chemical technology and established a production facility in conjunction with industrial enterprises to prove that nepheline "tailings" could be turned into an intermediate product for the derivation of, firstly, bauxite and then aluminum, secondly, soda and potash, and thirdly, portland cement.

The use of this technology could, incidentally, result in the production of enough soda for our own needs, and possibly even for profitable export. However...large quantities of soda ash, part of which is imported, are still being used in the processing of some grades of bauxite.

Therefore, instead of selling soda for foreign currency, we are using our own foreign currency reserves to import it!

This is absurd but true.

Let us return to the main issue--the method developed 6 five-year plans ago for the virtually complete use of the nepheline waste of apatite concentrate production. It was then that it became possible to derive 720 kilograms of soda ash, 320 kilograms of potash, 7-8 tons of portland cement and 40 grams of gallium, a rare element, for each ton of aluminum oxide produced.

An industrial facility for the use of this method was built in 1951 at the Volkov Aluminum Plant and then at the Glinozem Plant in Pikalevo. In the 1970's, a large aluminum oxide plant operating on local nepheline was built in Achinsk.

The experience of the Pikalevo and Volkov plants demonstrated the substantial economic impact of the processing of nepheline concentrate for aluminum oxide, soda ash, potash and cement. Aluminum oxide production costs were more than 40 percent below the sectorial average, soda costs were 40 percent below and cement costs were 9 percent below the average.

Nevertheless, the nepheline "tailings" did not diminish, but grew continuously. Agriculture needed more and more fertilizer, the extraction of apatite-nepheline ore was stepped up dramatically, and a second concentration facility was built in Apatity.

The total output of apatite-nepheline ore now amounts to almost 50 million tons, from which up to 20 million tons of apatite concentrate is derived. The remaining 30 million tons constitute the previously mentioned "tailings" that are added to slag heaps each year.

Around 500 million tons of this costly waste has already been accumulated. Two-thirds of it is nepheline, and the other third is a mixture of other minerals, also of considerable value.

The nepheline "tailings" are produced during the flotation process in the form of fine powder dispersed by the wind. This hurts the environment.

Calculations indicate that the value of the bauxite, aluminum, soda, potash and portland cement not derived from the "tailings" thus far amounts to billions of rubles.

These billions of rubles have been lost through senseless mismanagement; this is the result of grave errors. Today they are already history. It is important, however, not to repeat these mistakes. The new five-year plan and future plans should envisage specific ways of avoiding the errors of the recent past!

ECONOMIC CALCULATIONS PROVIDE IRREFUTABLE PROOF THAT DELAYS IN THE WIDESPREAD INTRODUCTION OF THE INDUSTRIALLY TESTED METHOD OF PROCESSING NEPHELINE RESOURCES HAVE INFILCTED HEAVY LOSSES ON THE NATIONAL ECONOMY.

THE COMPLETE RESOLUTION OF THE PROBLEM IS BEING HINDERED BY THE LACK OF INTER-DEPARTMENTAL COORDINATION AMONG AGENCIES RESPONSIBLE FOR ITS RESOLUTION: THE USSR MINISTRY OF NONFERROUS METALLURGY, THE USSR MINISTRY OF CONSTRUCTION MATERIALS INDUSTRY, THE MINISTRY OF THE CHEMICAL INDUSTRY AND THE MINISTRY OF MINERAL FERTILIZER PRODUCTION.

THE PROBLEM OF USING APATITE PRODUCTION WASTE MUST BE SOLVED AS QUICKLY AS POSSIBLE.

Aluminum is a metal of the 20th century and a metal of the future. Small additives of lightweight elements give it a combination of lightness and rust-resistance, durability and resiliency and make it superior to steel in many cases. Aluminum alloys are already being substituted for traditional metals in construction.

Soda is a product needing no introduction, as it is used in all branches of the national economy without exception.

Potash is the potassium fertilizer needed to increase the yield of many agricultural crops, especially potatoes. In contrast to other mineral fertilizers, it does not reduce the storage life of potatoes.

Portland cement is a material needed by all--from the gardener to the builder of hydroelectric power stations.

The national economy's need for these products increases with each year.

All of these different materials can be derived from one raw material--apatite-nepheline ore--when it is processed as completely as possible.

Finally, we feel that the use of secondary concrete and reinforced concrete warrants discussion.

There are hundreds of millions of cubic meters of waste concrete and ferro-concrete in slag heaps in the country, cluttering up the area around plants, construction sites, dumping grounds and so forth. Other countries are deriving gravel and other secondary products from waste concrete.

Scientists from the Moscow Chemical Technology Institute imeni D. I. Mendeleyev, the Scientific Research Institute of Concrete and Ferroconcrete and the All-Union State Scientific Research Institute of Cement have developed a new method of activating the minerals of concrete and silica brick in a low-temperature kiln. This was the world's first experiment in the derivation of low-grade binding materials, such as cement, from substandard concrete and silica brick. Traditional cement production uses three or four times as much energy as this method and costs 1.5-2 times as much.

Obviously, this is a matter of great national economic significance. The new progressive technology has won the support of USSR Gosstroy and should be instituted in the national economy without delay.

The country is now making preparations for the 27th CPSU Congress. The USSR ministries of nonferrous metallurgy, construction materials industry, chemical industry and mineral fertilizer production, USSR Gosplan and all economists must make precise recommendations, and these should be recorded in directive documents.

After publishing this article by Academician N. Zhavoronkov and Professor L. Sorin, the editors feel the need to stress the fundamental importance of these matters. They were discussed at length in 26th party congress documents and at the April (1985) CPSU Central Committee Plenum, the CPSU Central Committee conference on the acceleration of scientific and technical progress and the CPSU Central Committee conference of 23 August 1985 on the planning of the economic and social development of the USSR in 1986 and the 12th Five-Year Plan.

The editors would like to direct the attention of officials in the USSR Ministry of Nonferrous Metallurgy, USSR Ministry of Construction Materials Industry, Ministry of the Chemical Industry and Ministry of Mineral Fertilizer Production and the party committees of these ministries to the need to put an end to the lack of intersectorial coordination and the need for concerted action to attain the party's objective of the comprehensive use of the country's natural resources.

The party committees of the abovementioned ministries and departments must draw up party evaluations of the current state of affairs, in which a technology developed and approved many years ago has not been introduced at enterprises in the industries concerned.

We hope that the officials and party committees of these ministries will inform the newspaper of the measures they intend to take to eliminate the shortcomings mentioned in today's article, shortcomings inflicting serious losses on the national economy.

There is no question that USSR Gosplan, USSR Gossnab, the State Committee of the USSR for Hydrometeorology and Environmental Control and the State Commission for the Stockpiling of Useful Minerals will take an interest in these matters. We expect constructive responses from these agencies as well.

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## CONSTRUCTION METHODS AND MATERIALS

### SPECIAL CONSTRUCTION MATERIALS, MACHINERY LACKING IN SOUTH

Tashkent EKONOMIKA I ZHIZN in Russian No 5, May 85 pp 20-21

[Article by Sh. Sharifkhodzhayev, candidate of economic sciences, group leader, NIEI [Scientific Research Institute of Economics], UzSSR Gosplan, and V. Sazonov, construction engineer, Institute of Economics, UzSSR Academy of Sciences: "...And Special Regional Features"]

[Text] Natural and climatic conditions exert a large influence on the regeneration of fixed production capital (OPF) in construction. In addition to this, special regional and branch features are formed under the influence of natural and socioeconomic factors.

How do climatic conditions affect OPF? Average annual plus temperatures that are high in comparison with other regions of the country and the small amount of precipitation make it possible to reduce the share of the passive part of OPF because of the construction of buildings and structures with light materials, open warehouses and storage areas and so forth. The specific weight of buildings, structures and transfer installations in the total amount of OPF for construction purposes is about one-third; moreover, when climatic features are taken into consideration, construction expenses are reduced by 15-20 percent. This is one side of the coin.

The other side is an increase in the share of the active part of the OPF. For what reason?

In the spring-summer-fall periods, the daylight working day is lengthened from 10 to 16 hours; that is, for a significant period it is practically two shifts, which yields no small advantages. However, in the most extended period--summer--labor activity on construction sites is reduced by the day itself during its hottest hours. Labor conditions are particularly difficult for machine operators: in metal cabs the temperature reaches 70° and more. As a rule, work ceases for several hours. When totaled, this means huge losses of working time. There is only one conclusion: improve the working conditions for machine operators. It is necessary to build southern versions of construction machines and machinery. This, of course, requires additional expenditures, but they will be made up for. How?

In the first place, they will be compensated for by a reduction in the item "buildings and structures," which was mentioned above. In the second place,

construction production efficiency will be improved because of more productive use of the hot time of the day.

Another important feature of the region that affects the regeneration of OPP is seismicity. Our republic is in the 6-9 ball zone, it being the case that 63 percent of the territory, where more than 94 percent of the population lives, is in the 7-9 ball zone. It is well known that an increase in intensity increases the cost of an object significantly and, for all practical purposes, lengthens the amount of time needed to erect it. Yet another special feature is hidden in this latter fact. The action of seismic loads on a building or structure while it is being built causes the appearance of additional, constantly accumulating, uncalculated stresses in the structural elements. The energy of these uncalculated stresses, which reaches critical values, is released during seismic action of less intensity than that for which the building has been designed. As a result, the longer it takes us to build, the less actual seismic stability we achieve.

From this there comes a vitally important requirement: shorten construction periods to the standard ones. In order to do this it is necessary to increase the concentration of production and reduce the amount of unfinished construction by reducing the number of objects being built simultaneously and using the construction organizations' reserve production capacities.

With respect to the reservation of production capacities there exist certain scientific developments, but their introduction is being held up by a number of objective and subjective factors. The objective factor is that the technical level of the republic's construction production is below the Union average. The subjective one is inertia in the thinking of many production leaders, who have a negative attitude toward the problem of reservation of production resources. The reliability of the functioning of the construction system also consists of the existence of reserve capacities and their use on a maneuverable basis. This makes it possible to concentrate forces and means on complexes that are being started, impart a rhythmic nature to the work and shorten the construction period.

Under conditions of seismicity, which means practically the entire territory of Uzbekistan, reducing the cost of buildings and structures is possible on the basis of the use of efficient construction materials and designs. These materials include, first of all, porous aggregates, which have high strength and seismic stability. In particular, we think that it is most economical to use single-layer panels, made of light concretes based on artificial porous aggregates, in construction.

According to data from UzSSR Gosplan's NIEI, the calculated expense per square meter of single-layer agloporous concrete panels is 35-60 percent less than for three-layer reinforced concrete ones, and the calculated expense per square meter of single-layer keramzit concrete panels is, correspondingly, 5-30 percent lower than for designs made of small-piece materials and on average 10 percent lower than for designs made of heavy concrete. One of the bottlenecks is inadequate production of keramzit in the republic and its low quality. However, although it is planned to increase the production of

keramzit in the republic by a factor of 1.5 in the near future, it is necessary to discuss its quality separately.

Loams are the keramzit enterprises' raw material base. In order to improve their molding and drying qualities, corrective additives are needed. By-products of petrochemical and metallurgical enterprises can be used as complex additives.

There is yet another possibility for using industrial waste: about 40 percent of all the material participating in the steel-smelting process remains in the slag. When cooled in water, blast-furnace slag forms a foamy substance with the properties of cement clinker. If it is ground over with portland cement or mixed with a small amount of lime, an excellent binder can be obtained. Another example is soot, a by-product of the operation of coal-fired electric power plants. When mixed with water, soot forms lumps and agglomerates. In a mixture with portland cement, it produces a strong, water-resistant binder with a large working range and long durability. In addition to the economic efficiency of the use of the above-mentioned "waste," in production one cannot fail to take into consideration the ecological significance of the problem also.

The use of efficient designs and materials is closely related to planning, design, organizational and technical decisions. Buildings in a frame-panel version have the necessary seismic stability and, along with this, make it possible to use standardized structural elements, which improves the quality and reduces the labor-intensiveness and duration of construction work.

The intensive development of agriculture in Uzbekistan requires large capital investments in this branch. Although their specific weight for the country over the last 10 years has remained at an average level of 27 percent of the total volume of capital investments in the national economy, in the Uzbek SSR it was 46-47 percent during the same period. In connection with this, more than 80 percent goes for the construction of objects productive and non-productive purposes. This, also, must affect the regeneration of OPF in construction.

Considering the specific nature of rural construction, in particular the dispersal of objects, construction of only a few stories, the comparatively small amount of work done in a single place, the linear elongation of a number of structures and so forth, mobility is needed during production and the regeneration of OPF. Mobility means construction industry enterprises that can, when necessary, rebase themselves from one construction region to another. Therefore, they must be transportable and be able to be put into operation quickly. The principle of mobility must be based on the watch method of organizing construction work.

The socioeconomic features of agricultural construction include primarily the presence of two types of contracting construction and installation organizations. By volume of contractual work, the construction and installation organizations of the republic's Mezhkolkhozstroy [Interkolkhoz Construction Trust] lag behind only the Ukraine and the Russian Federation in this country.

However, even with the significant increase in the amount of construction and installation work, as far as technical equipment is concerned, the organizations of Uzbekistan's Mezhkolkhozstroy are considerably behind the enterprises of Minsel'stroy [Ministry of Rural Construction], which have an analogous work structure. The degree of equipping with basic construction machinery per million rubles of construction and installation work for excavation and transportation work lags behind by a factor of 1.5-2, that of crane equipment by a factor of 2.5-3, and for other types of technical equipment by a factor of 1.5. This disproportion cannot but affect the effectiveness of construction production and requires changes in the structure of OPF regeneration.

There is yet another, no less important factor in improving the OPF regeneration structure and increasing, on this basis, the effectiveness of production: allowing for the national features of the populace's requirements for living quarters. This is manifested in the attachment of population groups to a certain place, which is caused by ties of relationship; the desire is for one's own home, with participation in a complex of economic structures for the auxiliary economy, which is determined by national traditions and the non-occupation of part of the population in social production at socialist enterprises. In connection with this, variations in the living area in homes depending on the number of family members can be realized by grouping standardized sections. These requirements combine with the populace's good monetary capabilities. For instance, Uzbekistan's population is only one-third that of the Ukraine and one-eighth that of the RSFSR, but in volume of residential construction by the populace's means, by a factor of only two. Nevertheless, the populace's requirements for the construction of actual residences is not decreasing for all practical purposes; moreover, they are increasing from year to year. This requires an increase in the resources of the construction and installation organizations engaged in the construction of personal residences in rural areas.

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## CONSTRUCTION METHODS AND MATERIALS

### SYNOPSIS OF ARTICLES IN STROITELNNYE MATERIALY, SEP 85

Moscow STROITELNNYE MATERIALY in Russian No 9, Sep 85 p 30

UDC 666.002.5

#### IMPROVEMENTS IN ORGANIZING OPERATION OF EQUIPMENT AT CONSTRUCTION MATERIALS ENTERPRISES

[Synopsis of article by A.M. Shenyderov, O.V. Yamnov, Yu.A. Loskutov, pp 9-10]

[Text] An important element of repair production operations is the technical servicing and current repair of equipment, that is, work which is carried out by plant repair bases. A principal innovation in the organization of TO [technical servicing] and TR [current repairs] for equipment is an RRO [routine maintenance servicing] system, developed by VNIIESM [All-Union Scientific-Research Institute of Scientific-Technical Information and Economics of the Construction Materials Industry]. The essence of this system consists of a basically new approach for organizing the repair-operational servicing of equipment, with the basis for such work being the forced carrying out of complexes of preventive maintenance work aimed at preventing break-downs and raising the efficiency of equipment usage. From an economic standpoint, a reduction takes place in the total amount of expenditures for repair services as a result of a decrease in expenditures for ineffective capital repairs. In the process, a reduction of 20-40 percent takes place in the idle time of equipment during non-plan repair operations and labor productivity for repair work is raised.

UDC 666.961.033.002.51

#### RAISING THE PRODUCTIVITY OF SHEET-FORMING MACHINES THROUGH THE USE OF AN ANTI-FRICTION COATING FOR VACUUM BOXES

[Synopsis of article by I.M. Fisher, V.N. Lopatin, L.G. Mokhnatkin, M.M. Levicheva, p 11]

[Text] For raising the productivity of sheet-forming machines by increasing the speed of movement of technical cloths, a modernized structure has been proposed for a vacuum box having detachable plates and lined on top with high-molecular polyethylene. The technical-economic indicators for the operation of sheet-forming machines are furnished: productivity, consumption of technical cloths using vacuum-boxes with an anti-friction coating. 1 illustration, 1 table and 3 bibliographic references.

UDC 679.862.002.237

TECHNOLOGY FOR THE ENRICHMENT OF CONSTRUCTION SAND FOR HIGH-STRENGTH CONCRETE

[Synopsis of article by M.I. Khrustalev, V.A. Karpeyev, pp 12-14]

[Text] A new technological line has been developed and new equipment created for the enrichment of sand--SMD-162 hydraulic classifier--and for the dehydration of sand--SMD-161 vibrator-dehydrator. Positive test results have made it possible to turn them over for operation and to recommend the new equipment for series production at the Kostroma Strommashina Plant of Minstroydormash [Ministry of Construction, Road and Municipal Machine Building]. Three illustrations and 1 bibliographic reference.

UDC 666.972.125:666.64-492.3

IMPROVEMENT OF SEMI-PROCESSED POROUS CLAY FILLER GRAVEL WITH USE OF GRADING PRIOR TO CALCINATION

[Synopsis of article by A.A. Elkonyuk, E.M. Shkrob, p 14]

[Text] A method is described in the article for enriching a semi-finished product of porous clay filler gravel and the practical results from its use are furnished. Information is provided on the acceptance tests for a machine for use of the SP-15 semi-finished product at a porous clay filler plant of Kuybyshevselstroy. The economic effect from the introduction of the unit on the technological line of the porous clay filler plant, with its capability of 100,000 cubic meters annually, will amount to approximately 28,000 rubles. One illustration, one table and one bibliographic reference.

UDC 666.002.52

VACUUM CLAMPS FOR THE TRANSPORTING OF CONSTRUCTION PRODUCTS

[Synopsis of article by R.A. Luus, pp 15-16]

[Text] Information is provided on the development and introduction by the NIPI Silico-concrete Institute of vacuum freight-clamp units for the raising and transporting of silico-concrete wall panels at the Narva Construction Materials Combine. The basic diagrams for the vacuum clamps are also provided in accordance with the expanded classification developed by the author. The classification used earlier for vacuum freight-clamp units has been supplemented by two new developments--pneumatic and condensation units. The operational principles of these units are described. One illustration and five bibliographic references.

UDC 666.965.2.002.52

#### UNIT FOR THE PACKAGED TRANSPORTING OF SILICATE BRICK

[Synopsis of article by I.E. Langeberg, A.M. Sinotov, U.V. Pilvre, pp 16-17]

[Text] The status of packaged transporting of silicate brick is analyzed and the principal reasons for a low level of packaged shipments are noted. An analysis is carried out on the causes of packages coming apart during transporting. A method is developed for determining the pressure that brick is subjected to in a package. It is established that when use is made of the means available at the present time, there will be areas in a package in which the bricks will not be under pressure. A new structure has been developed for the upper tightening strap, which ensures uniform distribution of the vertical tightening force. A stand has been developed and produced for testing packages for dynamic stresses. Two illustrations.

UDC 666.1.036.25.666.011.56

#### UNIT FOR THE AUTOMATIC IGNITING OF BURNERS IN THE PRODUCTION OF MINERALIZED PLATES

[Synopsis of article by G.A. Kartashov, pp 17-18]

[Text] A unit has been proposed for the automatic igniting of burners of a hardening furnace on a technological line for the production of mineralized plates, in the interest of ensuring safe operations. The unit also performs the function of regulating the temperature in the furnace interior and controlling and signalling the operation of the equipment. The basic diagram for the unit and its technical characteristics are described. The introduction of this unit at the Maltinskiy Construction Materials Plant made it possible to reduce the idle time of the equipment and raise its maintainability. The unit can be used for other thermal objects, for example for igniting burners in boilers. One illustration.

UDC 666.961.002.237

#### ASBESTOS-CEMENT CLUTCHES OF RAISED DURABILITY IN IRRIGATION SYSTEMS

[Synopsis of article by M.Ye. Chechenin, pp 19-20]

[Text] SAM-U asbestos-cement clutches of a raised durability have been proposed for connecting up asbestos-cement pipes during the installation of irrigation system pipelines. The width of the extreme collars of these clutches and, it follows, the area along which their shear is possible, is greater by a factor of 1.6 than that for standard SAM clutches. Experimental batches of the reinforced clutches were produced at the Kiev Combine for Asbestos-cement Products. The reliability of a pipeline 1.2 kilometers long, consisting of 5-meter Mark VT-15 asbestos-cement pipe, with a standard opening of 500 millimeters

and SAM-U clutches, was displayed. The technical conditions for the new products have been approved by Glavasbrsttsement. With the introduction of the new clutches, the reliability of irrigation systems will be raised and expenditures for repair work on a pipeline will be reduced. One illustration.

UDC 666.92:65.011.56

#### CONTROL OVER THE PRODUCTION OF LIMESTONE MEAL USING MICRO-PROCESSOR EQUIPMENT

[Synopsis of article by G.I. Levin, pp 22-24]

[Text] An examination is undertaken of an experiment in planning and the functional potential and principal technical characteristics of a micro-processor objectively oriented system (OOK), developed for an ASUTP [automatic system for controlling a technological process] for the production of limestone materials based upon unitized technical equipment of local LIUS-2 information-control systems. Comparative technical-economic indicators are cited for the ASUTP's of two similar departments, introduced at the Vitebsk Dolomit PO: ASUTP of Department No 5 at a base for a controlling KM2101 EVM [computer] and ASUTP of Department No 7 at a base for the created micro-processor OOK. One illustration and 2 tables.

UDC 666.972.7.004.8

#### WASTE PRODUCTS OF THE MINING INDUSTRY IN THE PRODUCTION OF HIGH TEMPERATURE CONCRETES

[Synopsis of article by M.V. Kornilova, pp 25-26]

[Text] The results of studies of the composition and properties of waste products from the enriching of asbestos are cited. A method is furnished for obtaining a filler for concretes having a use temperature of up to 1200° Centigrade. The concrete structures have been developed and their properties and areas of use defined. An experiment in testing the materials developed in industry is cited. One illustration.

UDC 666.7.004.8.001

#### EFFECT OF ALKALI ADDITIVES ON PHASE CHANGES DURING THE ROASTING OF ASH-CLAY MATERIALS

[Synopsis of article by I.M. De, S.T. Suleymenov, S.Zh. Saybulatov, and others, pp 27-28]

[Text] The effect of alkali additives on phase changes during the roasting of ash-clay materials has been studied. It was established that the formation of an alkali-silicate fusion slows down the process of a modified change in the silica, but it intensifies the processes of mullite formation and the polymorphic conversion of quartz. The addition of alkali serves to lower the roasting temperature for the items by an average of 50-100° C.

UDC 666.91.001

METHODS FOR REGULATING THE HARDENING TIME FOR PHOSPHOGYPSUM ASTRINGENTS

[Synopsis of article by M.I. Kuchma, T.A. Melnik, pp 28-29]

[Text] In the interest of expanding the assortment of astringents available for construction, studies were carried out on the composition of heat-treated phosphogypsum with effective hardening inhibitors. The effect of the inhibitors on the durability and water resistance of phosphogypsum stone was studied. Data is furnished on the kinetics concerned with the hardening of phosphogypsum astringents at low and raised temperatures and also on the methods for using them in road pavement structures. One table.

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CONSTRUCTION METHODS AND MATERIALS

BRIEFS

**CEMENT SUBSTITUTE-(TURKMENINFORM)**--A worthy "rival" of cement will soon make its appearance on republic construction sites. It is phosphogypsum, produced from the waste products of the Chardzhou Chemical Plant imeni V. I. Lenin according to technology developed by scientists at the Turkmen Scientific Research Institute of Earthquake-Proof Construction. Phosphogypsum is a fundamentally new raw material for the republic construction industry. Although it is virtually equivalent to cement in terms of its basic properties, it is several times cheaper and much lighter and can replace several popular grades of cement--from "75" to "300"--in the construction industry. The advantages of this new material will encourage its widespread use in construction, especially in the earthquake zone. It can be used in the manufacture of decorative elements--its natural white color is decorative in itself--and of paneling and roofing materials--it is weather-hardy. Production waste, the so-called "tails," now occupy a huge area around the Chardzhou Chemical Plant, and the slag heaps grow larger with each year. This results in the inefficient use of scarce land in an irrigated zone and hurts the environment. Calculations indicate that there is enough phosphogypsum raw material in the enterprise's dumping grounds for the immediate annual production of 100,000-150,000 tons of construction material. The processing of plant waste products will represent an important step toward the introduction of a waste-free mineral fertilizer production technology. [Text] [Ashkhabad TURKMENSKAYA ISKRA in Russian 31 Aug 85 p 2] 8588

**UPDATED HEAT TREATMENT**--Sabirabad --Remodeled chambers for the heat treatment of reinforced concrete items are operating reliably at the Sabirabad Industrial Combine. Whereas this treatment once took 24 hours, it now takes 8. The augmentation of labor productivity by a third has allowed the section work team to manufacture dozens of additional square meters of reinforced concrete elements per shift. The substitution of percussion for vibration technology has reduced concrete sealing time from a minute to 15 seconds. As a result, industrial combine workers are confidently fulfilling the state assignment and their socialist commitments and have 120,000 rubles' worth of above-plan products to their credit. Several thousand reinforced concrete items--gutters, tiles and others--have been sent to republic land reclamation enterprises ahead of schedule. [by I. Shirinov] [Text] [Baku BAKINSKIY RABOCHIY in Russian 10 Sep 85 p 1] 8588

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